ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 1.] [1908.

I.—FUNGI EXOTICI, VII.

G. MASSEE.

The Fungi enumerated and described in the following pages were all collected in the Singapore Botanic Gardens. The specimens were sent to Kew by Mr. H. N. Ridley, F.R.S., Director of the Gardens, together with very beautifully executed coloured drawings, which have been placed with the specimens in the Herbarium. The drawings were made by Mr. Charles George de Alwis, grandson of the Ceylon artist Mr. de Alwis, who figured the extensive series of Fungi collected by Thwaites in Ceylon.*

This well-preserved collection of specimens from Singapore, accompanied by such excellent figures, has afforded one of the few opportunities for dealing with fleshy exotic Fungi in a satisfactory manner. All the previously described species included in this list, with the exception of *Boletus scaber*, Fries, have been recorded from Ceylon.

Tricholoma nudum, Pers., and *Boletus scaber*, Fries, are common species in Britain.

Lepiota licmophora, Berk. and Br., and *L. citriophylla*, Berk. and Br., first recorded from Ceylon, have been imported to this country, and are now not uncommon in hothouses at Kew and elsewhere.

The beautiful miniature earthstar, *Geaster papyraceus*, Berk. and Curt., is the eastern representative of the genus, having previously been recorded from Bonin Island, Hindustan, Ceylon and Japan.

AGARICACEAE.

Amanita virginea, *Massee*. *Pileus* carnosus e convexo expansus, siccus, albidus, flocculoso-squamosus, centro squamoso-hirtus, 10-12 cm. latus. *Lamellae* confertae, latae, ventricosae, liberae,

* Berkeley and Broome in *Journ. Linn. Soc.* 1871, xi., p. 494.

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postice annulatim conjunctae, albidae. *Sporae* ellipsoideae, basi apiculatae, 7–8 × 4 μ. *Stipes* e farcto cavus, albidus, supra annulum levis, infra floccis squamosis dense obsitus, volvae circumscissae obliterataeque margine adpresso arcte vaginatus, annulo distante evanescente, 10–12 cm. longus, 2–2·5 cm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 87, I.

Distinguished amongst known species by being entirely white. The imperfectly formed annulus suggests that the present species occupies an intermediate position between the genera *Amanita* and *Amanitopsis*, the latter differing from the former only in the absence of an annulus.

Lepiota felina, *Pers.*
Ridley, No. 33.

Lepiota inebriata, *Berk. and Br.*
Ridley, No. 47.

Lepiota holospilota, *Berk. and Br.*
Ridley, No. 20.

Lepiota licmophora, *Berk. and Br.*
Ridley, No. 79.

Lepiota phlyctarodes, *Berk. and Br.*
Ridley, No. 61.

Lepiota euconiata, *Berk. and Br.*
Ridley, No. 41.

Lepiota citriophylla, *Berk. and Br.*
Ridley, No. 66.

Lepiota coniocephala, *Berk. and Br.*
Ridley, No. 44.

Tricholoma theiochroum, *Berk. and Br.*
Ridley, No. 68.

Tricholoma charisterum, *Berk. and Br.*
Ridley, No. 64.

Tricholoma nudum, *Pers.*
Ridley, No. 86.

Armillaria squamosa, *Massee.* *Pileus* carnosus, e convexo expansus depressusque, flocculoso-squamosus, demum glabrescens, cinnamomeus, 3–4 cm. latus. *Lamellae* latae, ventricosae, subdistantes, albidae, acie integra. *Sporae* ellipsoideae, hyalinae, basi oblique apiculatae, 7–8 × 4–5 μ. *Stipes* supra annulum albus, infra fusco-squamulosus, dein squamulis secedentibus, pallidus, farctus, 5–6 cm. longus, 4–5 mm. crassus; annulus superus, reflexus, amplus, margine fimbriatus.

SINGAPORE. On the ground. *Ridley* No. 61, I.

A distinct species remarkable for the seceding flocculose scales of the pileus, and the large, superior, pendulous ring. Allied to *Armillaria omnituens*, Berk.

Collybia acuminata, *Massee.* *Pileus* carnoso-membranaceus, e campanulato convexus, acutissime umbonatus, cinereus —umbo obscuriore, fibrilloso-virgatus, margine fimbriato-lacerus, aetate rimosus, 7–9 cm. latus. *Lamellae* confertae, postice rotundato-adnatae, albido-griseae. *Sporae* hyalinae, subglobosae, 6 × 5 μ. *Basidia* clavata, 25–30 × 7–8 μ. *Stipes* elongatus, mox cavus, fibrilloso-striatus, deorsum ventricosus, radicatus, pileo concolor, basi albo-tomentosus, 12–14 cm. longus.

SINGAPORE. On the ground. *Ridley.* No. 22 V.

A well-marked species, characterised by the prominent, very acute, dark umbo, and the ventricose stem. Allied to *Collybia fusipes*, Bull.

Mycena cuspidata, *Massee.* *Pileus* membranaceus, e conico-campanulato subexpansus, umbone valde prominente praeditus, margine mox fissus, longitudinaliter sulcatus, fibrillosus, stramineus, centro brunneus, siccus, 5–7 cm. latus. *Lamellae* confertissimae, strictae, adnexae, ex albo-incarnato-tinctae, acie dentatae. *Sporae* hyalinae, ellipsoideae, basi oblique apiculatae, 7–8 × 5 μ. *Stipes* solidus, aequalis vel basi attenuatus, glaber, pileo concolor, deorsum fuscescens, 9–12 cm. longus, circa 1 cm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 25, Y.

With the general aspect of *Mycena galericulata*, Fries, but differing in being a much larger species. The most pronounced features are the solid stem, and the very large, acute umbo.

Clitocybe laccata, *Pers.*

Ridley, Nos. 1, 37, 78.

Lentinus similis, *Berk.*

Ridley, No. 9.

Lactarius tricolor, *Massee.* *Pileus* carnosulus, e convexo depressus vel infundibuliformis, margine primitus involutus alboque pruinatus, zonatus, castaneus, 4–5 cm. latus. *Lamellae* confertissimae, angustae, ochraceae. *Sporae* globosae, spinulosae, hyalinae, 6–7 μ diam. *Stipes* farctus, sursum attenuatus, glaber, purpureus, 4–5 cm. longus, 1 cm. crassus. *Lac* ignotum.

SINGAPORE. On the ground. *Ridley*, No. 30, D.

Structurally the present species approaches to *Lactarius quietus*, Fries, but differs in having smaller spores, and in the tricoloured ornamentation—chestnut pileus, ochraceous gills and purple stem.

Hygrophorus conicus, *Fries.*

Ridley, No. 85.

Volvaria geaster, *Berk. & Br.*

Ridley, No. 23.

Entoloma iodnephes, *Berk. & Br.*

Ridley, No. 19.

Clitopilus flavidus, *Massee.* *Pileus* carnosus, e convexo umbilicatus vel infundibuliformis, margine undulatus vel lobatus, laevis, minute squamulosus, flavidus, 4–5 cm. latus. *Lamellae* subconfertae, plus minusve decurrentes, albo-incarnatae. *Sporae* ellipticae, laxe et minute asperulae, roseo-tinctae, 6–7 × 4–4·5 μ. *Basidia* clavata, 21–25 × 6–7 μ. *Stipes* farctus, subfibrillosus, basi incrassatus, lacunosus, pileo concolor, 3–4 cm. longus, 1 cm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 56, D.

Distinguished from the known species of *Clitopilus* by its yellowish, minutely squamulose pileus. Near to *Clitopilus orcellarius*, Ces., from Borneo.

Clitopilus curtipes, *Massee.* *Pileus* carnosulus, cyathiformis, margine involutus, saepe lobatus, striatus, glaber, umbrino-ochraceus, expallens, 4 cm. latus. *Lamellae* distantes, plus minusve decurrentes, antice latissimae, incarnatae. *Sporae* subglobosae, nodulosae, incarnatae, 6–7 μ diam. *Stipes* farctus, fibrillosus, deorsum arcte attenuatus, basi subincrassatus et albo-tomentosus, 2 cm. longus, versus apicem 4 mm. crassus, pileo subconcolor.

SINGAPORE. On the ground. *Ridley*, No. 9, I.

Readily distinguished amongst known species of *Clitopilus* by the dusky pileus and stem. The latter is short and strongly attenuated downwards.

Eccilia hyalodepas, *Berk. & Br.*

Ridley, No. 23.

Gomphidius roseus, *Massee.* *Pileus* carnosus, subgelatinosus, convexo-umbonatus, flocculosus, glabrescens, pallidus, roseo-marmoratus, 3–4 cm. latus. *Lamellae* decurrentes, subconfertae, crassae, poroso-anastomosantes, olivaceo-flavae. *Sporae* oblongae, olivaceo-flavae, 12–15 × 4–5 μ. *Stipes* solidus, sursum incrassatus, flocculosus, pallidus, hic inde roseo-tinctus, 3 cm. longus, sursum 0·5 cm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 57, E.

Readily distinguished from the half-dozen known species of *Gomphidius*, which are confined to Europe and the United States, by the pale-coloured pileus streaked or marbled with rose-colour, the pale stem attenuated downwards, and the elongated spores.

Inocybe longipes, *Massee.* *Pileus* carnosulus, hemispherico-expansus, umbrino-purpurascens, squamosus, siccus, 3–4 cm. latus. *Lamellae* confertae, adnato-adnexae, ventricosae, ex albo lilacinae, acie obsolete fimbriata. *Sporae* subglobosae, nodulosae, lilacino tinctae, 7–8 μ diam. *Stipe* sursum attenuatus, subtiliter striatulus, apice pruinatus, albo-lilacinus, basi albidus et nudus, 7–8 cm. altus, 4 mm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 73, U.

Allied to *Inocybe lanuginosa*, Bull., but differing in the pale, elongated stem and lilac gills.

Stropharia peronata, *Massee.* *Pileus* carnosulus, e convexo planus, siccus squamulosus, umbrinus—versus centrum obscuriore, granulis minutis concoloribus dense obsitus, 3–4 cm. latus. *Lamellae* confertae, angustae, sinuato-adnexae, umbrinae dein purpurascentes, acie concolor integra. *Sporae* oblique-ellipsoideae, purpureo-brunneae, 7 × 5 μ. *Stipes* fistulosus, tenuis, sursum attenuatus, pileo concolor vel dilutior, velo albo peronatus subannulatusque, 10–12 cm. altus, 3–4 mm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 55, C.

A very distinct species, recognised at once by the white buskin-like veil sheathing the stem and terminating in the superior annulus. Allied to *Stropharia squamulosa*, Fries.

Stropharia umbonata, *Massee.* *Pileus* carnosulus, e convexo expansus, acute umbonatus, siccus fuscidulus, squamis parvis concoloribus dense vestitus, margine flexuosus, 3 cm. latus. *Lamellae* confertae, postice sinuato-adnexae, brunneae acie albo-pruinata et minute denticulata, 3–4 mm. latae. *Sporae* ellipsoideae, basi oblique apiculatae, brunneae, 6 × 4 μ. *Stipes* e medulloso farctus, cavus, cylindraceus, supra annulum pallide brunneus, infra pulchre et laxe squamulosus, albidus, annulus superus, amplus, interdum reflexus, 4–5 cm. longus, 4 mm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 36, J.

Characterised by the brown, scaly pileus, and by the stem being covered with whitish scales below the large, superior ring. Allied to *Stropharia squamulosa*, Fries.

Hypholoma elatum, *Massee.* *Pileus* carnosulus, e conico-campanulato expanso-umbonatus, brunneus—umbone pallidiore fibrillosus dein diffracto-squamulosus, margine infractus et saepe lobatus, 6–8 cm. latus. *Lamellae* confertae, ventricosae, sinuato-adnatae, umbrinae, acie subtiliter fimbriata. *Sporae* oblique ellipsoideae, umbrinae, 6 × 4 μ. *Stipes* solidus, subaequalis, undique fibrillosus, apiceque leviter furfuraceus, pileo concolor, 9–12 cm. longus, 1–5 cm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 83, E.

Remarkable in the genus *Hypholoma* for the distinct umbo and the elongated stem. There is also a total absence of the yellow and greenish colours so prevalent in the genus. Allied to *H. atrichum*, Berk.

POLYPORACEAE.

Boletus scaber, *Fries.*

Ridley, No. 69.

HYDNACEAE.

Calodon Ridleyi, *Massee.* *Pileus* suberosus, campanulatus, obtusus, e velutino glabrescens, in prima evolutione coelestinus, dein coeruleo-nigrescens, margine lilaceus, laciniatus, 3 cm. latus. *Aculei* subulati, nigro-fusci, apice expallentes. *Sporae* subglobosae, verrucosae, brunneae, 4–5 μ diam. *Stipes* solidus, centralis subaequalis, tomentosus, mox glabrescens, pileo concolor, 3–4 cm. longus, 5–7 mm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 72, T.

A very distinct and well-marked species. When quite mature every part is blackish with a suggestion of blue. When younger the blue tint is more distinct, and the growing margin violet or lilac. Not approaching any described species in form, structure and colour.

LYCOPERDACEAE.

Geaster papyraceus, *Berk & Curt.*

Ridley, No. 23, W.

On wood, springing from a dense, compact mass of white mycelium.

Lycoperdon rubicula, *Berk & Br.*

Ridley, No. 52.

GEOGLOSSACEAE.

Geoglossum spathulatum, *Massee.* *Ascomata* spathulata arcte compressa, distincta, farcta, nigra, pilosella, 1-1·5 cm. longa, 2–3 mm. crassa. *Stipes* subaequalis, e medulloso farctus, mox cavus dein subcompressus, velutinus, concolor, 3–4 cm. longus, circa 2 mm. crassus. *Asci* cylindraceo - subclavati, 8–spori, 80–90 × 9–10 μ, iodio haud tincti. *Sporae* cylindrico-clavatae, dilute brunneae, multi-septatae, utrinque acutae, 65–70 × 5–6 μ. *Paraphyses* filiformes, septatae, capitatae, sursum brunneo-tinctae.

SINGAPORE. On the ground. *Ridley.*

Most closely allied to *Geoglossum glabrum*, Pers., differing in the very much compressed, slightly pilose ascophore, and the longer, multiseptate spores.

II.—THE FRUIT FLY.

(*Ceratitis capitata*, Wied.)

For many years past the Fruit or Orange Fly, *Ceratitis capitata*, Wied., has seriously damaged the fruit crops in Western Australia, South Africa, St. Helena, Bermuda, and other countries. As long ago as 1896 a communication was received from the Acting Governor of St. Helena referring to the destruction of peaches in the island by fly, and, from the specimens sent at the time, W. F. H. Blandford, F.E.S., determined the insect as *Ceratitis capitata*, the well-known Orange Fly of Malta and elsewhere. In his report, which was sent to St. Helena, an interesting account of the distribution of the fly is given, together with suggestions as to the best means for its destruction. Whether these suggestions were given a fair trial does not appear. The pest, however, does not appear to have been in any way overcome, for in 1904 a letter was received from the Governor of St. Helena stating that "for the last 22 years the fruit in this colony has suffered severely from the ravages of a fly." This pest was supposed to have been intro-

duced into St. Helena from the Cape in a shipment of grapes. Legislation was proposed with a view of exterminating the fly, but if carried out, does not appear to have had beneficial results.

Frequent references to the destruction caused by *Ceratitis capitata* are to be met with in the agricultural journals of the Cape of Good Hope, Western Australia, Tasmania, New Zealand, and other countries, where it is referred to under the names of Mediterranean, Peach or Orange Fly.

Another pest of similar habits, *Tephritis Tyroni*, occurs in Queensland, where it attacks the orange trees, but as it appears to be confined to tropical countries it has not the wide range, and does not cause damage to the same extent as the *Ceratitis*.

The occurrence of the "Mediterranean fly" (*Ceratitis*) in so many widely separated localities appears to be due to its introduction in infected fruit whence it has spread far and wide; it is thought that its introduction into the Cape was by means of fruit from Madeira, and it appears to have reached Tasmania from Sydney. Considerable doubt exists as to the native home of the insect; it has been found in Brazil by Mr. George Compere, where it is kept in check by a predatory beetle, and this points to the possibility that Brazil may be the original home of the species.

This discovery by Mr. Compere leads up to the question as to how the parasite can be kept down or destroyed. The problem has been attacked in several ways. On the one hand repeated attempts have been made to find some substance which will serve both as an attraction and as a poison to the flies, and this has been coupled with the destruction by burning, boiling, or deep burying of all infected fruit to kill the pest in the larval or maggot stage. Then, particularly in the Cape districts, netting of the trees has been resorted to, which, though troublesome and costly, appears to have been highly successful for "bush" trees. This method, could it be adopted for all trees, would of course bring about the extermination of the pest, the fruit being an essential factor in the life history of the fly, inasmuch as the propagation of the species is dependent on fresh broods of flies from eggs laid in the fruits. In this connection it may be noted that the orange offers considerable difficulties in the way of the extermination of the fly owing to the long period of time which elapses between the ripening of the earliest and latest fruits of the crop. Furthermore, the constant succession of different fruits such as apple, apricot, fig, kei apple, lemon, orange, passion flower, peach, pear, plum, &c., affords a continuous series of hosts in which the flies can lay their eggs.

An interesting experiment to bring about the destruction of the fly by natural agencies is due to Mr. Compere, who discovered and collected the parasite of the fruit fly in Brazil. The beetle *Hexamerocera brasiliensis*, one of the *Staphylinideae*, is predaceous on the larvæ of the fruit fly, and it is hoped that its introduction into Western Australia will lead to the extermination of the fly. Investigations as to this parasite have also been carried out by the Cape Government Entomologist, but though all these matters are as yet only in the experimental stage it does not appear likely that any great measure of success will result from the introduction of

this beetle. It is of interest to point out that a similar mode of attack—by means of an internal parasite—has been tried against the olive fly *Dacus oleae*, Rossi, in Italy without very encouraging results.

Artificial means therefore appear to offer the only safe way of combating the pest, and numerous forms of poisonous solutions have been tried.

In Western Australia cyanide of potassium or arsenic with orange juice was placed in saucers about the fruit trees, but neither of the poisons appeared to be efficient either in attracting or poisoning the flies (v. *Journal of Agriculture, Western Australia*, Vol. 10, 1904, p. 27). In the following year a report of further experiments is given in the same Journal (Vol. 11, p. 115), in which McDougall's insecticide tree wash was used for spraying orange trees with very satisfactory results. The trees were sprayed four times, about once a month, and the mixture used was 1½ gallons of wash to 40 gallons of cold water. The cost of this treatment was moderate and no injury resulted to the fruit from its employment. It appears, however, that the pest in the case of this experiment was the Queensland fly *Tephritis Tyroni*. Another mixture to be used for spraying is suggested by Mally in the *Cape Agricultural Journal*, Vol xxv., 1904, p. 660, and consists of 1 lb. arsenate of lead, 25 gallons of water, and 5 gallons of treacle. The results from this mixture have been encouraging, and it is of interest to note that Professor Berlese in Italy has evolved a somewhat similar compound for the destruction of the olive fly, which may also prove of value against the *Ceratitis*. The solution is as follows: honey, 31 per cent.; molasses, 65 per cent.; glycerine, 2 per cent.; arsenite of potash, 2 per cent. When required for use the mixture, which can be stored indefinitely, must be dissolved at the rate of 10 parts of the mixture to 90 parts of water.

This mixture would be more expensive than that suggested by Mally and it is thought that the arsenite of potash might scorch the trees, but owing to the success which has attended Professor Berlese's experiments in Italy it would seem that this solution should be given a fair trial. An account of the method will be found in the *Cape Agricultural Journal*, Vol. xxx., 1907, p. 193.

By far the most efficient and useful destructive agent against the Fruit Fly has quite recently been brought to our notice by the Secretary of State for the Colonies, who has forwarded to Kew the following correspondence between the Governor of St. Helena and the Government Entomologist of Tasmania.

The GOVERNOR of ST. HELENA to the HIGH COMMISSIONER for SOUTH AFRICA.

The Castle, St. Helena,
August 26th, 1907.

MY LORD,

I HAVE the honour to transmit herewith for your Lordship's information copy of a communication lately received by this Government from the Government Entomologist of Tasmania

on the subject of the destruction of the fruit pest known as the peach-fly. As this fly exists in some parts of South Africa, and was in fact imported into St. Helena in a crate of grapes from South Africa 25 years ago, your Lordship may consider the information given in the enclosure as worthy of circulation in the South African Colonies.

I have not yet been able to apply the kerosene remedy in this Colony as the peach-fly does not commence active operations before October or November.

I have, &c.,

(Signed) H. L. GALLWEY.

Right Honourable
The Earl of Selborne, G.C.M.G.,
High Commissioner for South Africa,
Johannesburg, Transvaal.

GOVERNMENT ENTOMOLOGIST, TASMANIA, to SECRETARY, DEPARTMENT of AGRICULTURE, ST. HELENA.

Department of Agriculture,
Hobart, Tasmania,
May 24th, 1907.

DEAR SIR,

SOME time ago a communication from St. Helena as to the extermination of the fruit fly was forwarded to me, and in reply I stated that probably the only chance you would have of exterminating that pest would be by gathering and destroying the whole of your fruit for one season.

Since then a most remarkable discovery was accidently made in Western Australia, where it was found that pure kerosene attracted the flies. This discovery has since been confirmed in New South Wales and Victoria, so that it is probable that the fruit fly (*Halterophora*, or *Ceratitis capitata*) will be attracted by kerosene wherever it occurs. I send you a copy of part of an article from the Journal of the Department of Agriculture of Western Australia (April, 1907, page 245) being so far as I am aware the only official report of its use, although newspaper reports have been plentiful, and I have had several letters from various entomologists confirming it.

I am, &c.,

(Signed) ARTHUR M. LEA.

(Enclosure.)

"Recently Mr. Davenish of Guildford discovered the fact that pure kerosene oil, when placed in an orchard or garden where the fruit fly (*Ceratitis capitata*) existed, attracted that fly; and by placing a shallow vessel containing some kerosene in amongst the branches of the trees the flies would be destroyed by hundreds. Mr. H. E. B. Gull, also of Guildford, carried out, simultaneously with Mr. Devenish, promising experiments with kerosene."

"Since my return to the State, in company with Mr. Newman, we made some experiments with the kerosene in some close by

gardens, with a view to ascertain if the flies were in reality attracted by the kerosene oil, or if their getting into it was purely accidental. Our experiment showed that there is nothing accidental in connection with their getting into the oil, but showed most clearly that the kerosene really attracted the flies. A vessel containing some kerosene was placed in the forks of a tree about 18 inches above the ground, and at a point where ordinary specimens of the flies are never noticed. Within 15 minutes after having placed the vessel in the position above mentioned dozens of flies could be noticed moving about the trunk of the tree making their way to the oil; and 18 hours later Mr. Newman removed and counted 124 fruit flies from the one vessel. Female flies removed from the oil showed upon examination to be fertile, being yet full of eggs."

In the article from which the above quotation is made, a figure is given of a self-feeding tin for the capture of the fly. It should be noted that the tins must be shallow, such as lids of cocoa tins, &c., and it is found in practice that they are most effective when half full, and inclined at a slight angle. It is reported in the September number of the *Journal of Agriculture, Western Australia*, 1907, that no less than 1,268 flies were destroyed by kerosene in 24 hours; whilst in another orchard, where no flies could be seen, and only a few maggoty fruits had been found, the kerosene caught a single pair of flies. Since the kerosene only kills the adult flies, it will still be necessary to collect daily and boil or burn all the fallen infected fruit, and so kill as many of the maggots as possible. With these two methods of attack, which are being enforced in Western Australia, it seems likely that the fruit-fly pest may be held in check.

Yet another weapon against the fruit-fly is recorded in the same journal for October, 1907, namely, "Cold storage" of the newly punctured fruit. It has been stated that if the newly punctured fruit be stored in the refrigerator, the larvae are killed before they can do any damage to the fruit, and also that the fruit itself ripens nearly as well in the ice chamber as it would have done on its native branch in the sunshine.

As regards kerosene, it appears to be attractive to the flies only in dry weather, for, with a moist atmosphere, the kerosene traps are not visited, and the oranges (in this case) continued to be attacked.

Cold storage then appears to confer two benefits, for not only is the insect pest destroyed, but also the grower is able to keep back his fruit, so as to sell it in a better market.

In Bermuda, where the *Ceratitis* has come under special legislation ("The Fruit-fly Destruction Act, 1907"), it is of interest to note from the report published in *The Bermuda Colonist* of August 12th, 1907, that good results have attended the work carried out under the directions of the Act. The methods employed have been destruction of infected fruit and pruning of trees to prevent the bearing of fruit, which would serve for the reception of the fly's eggs. So that, whilst at the time of writing, they had very few flies, they were also almost destitute of fruit. If the preventive measures which appear to

have been so thoroughly carried out in Bermuda are supplemented by the use of kerosene, there would seem to be every prospect of the pest being exterminated from the island.

In conclusion, a note of warning is needed nearer home. As long ago as 1900 M. Alfred Giard announced the presence of *Ceratitis capitata* in the neighbourhood of Paris (*Comptes rendus*, t. cxxxi., 1900, p. 436). The insect, at first very scarce, restricted its attacks to the apricots, and no attempt appears to have been made to destroy the pest although sound advice was given.

In a further communication (*Comptes rendus*, t. cxliii., 1906, p. 353) M. Giard states that the ravages of the insect have greatly increased, and that the peaches are now seriously attacked in various localities around Paris. He is of the opinion that, with a series of dry summers, the pest will be as disastrous to the fruit growers around Paris as it is at the Cape unless systematic preventive measures are adopted.

Compere, G. Journ. Agric. West. Australia. 10, 1904, pp. 68–72.
Gives an account of the introduction of the Fruit-fly parasite.

Compere, G. Journ. Agric. West. Australia. 12, 1905, p. 6.

Mally, C. W. Agric. Journ., Cape of Good Hope. XXV., 1905, pp. 647–661, with plate.
A detailed account of the life history of *Ceratitis capitata*, and proposed methods of destruction, &c., and prevention of attack.

Jefferson, J. S. Journ. Agric. West. Australia. 15, 1907, pp. 161–166.
A short account of the Fruit-fly, with the results of using the "Fruit-fly Exterminator," the composition of which is not stated.

Compere, G. Journ. Agric. West. Australia. 15, 1907, pp. 244–245, with plate.
Kerosene remedy and the Fruit-fly.

Hooper, T. Journ. Agric. West. Australia. 15, 1907, pp. 696–697.
Fruit-fly : Instructions to growers.

Hooper, T. Journ. Agric. West. Australia. 15, 1907, pp. 772–774.
Fruit-growing industry.

III.—DECADES KEWENSES

PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM.

DECADES XLV-XLVI.

441. **Durandea angustifolia**, *Stapf* [Linaceae]; quoad folia *D. oreogenae*, Stapf (*Hugoniae oreogenae*, Schlecht.) similis, sed foliis angustioribus minus conspicue dentatis et floribus in racemos axillares dispositis distincta.

Frutex glaberrimus, ramis cortice pallido fere ochraceo obtectis, gemmis minutis. *Folia* anguste oblanceolata, basi longe attenuata, crenulato-dentata, 8–14 cm. longa, 1·4–1·8 cm. lata, coriacea, exsiccando fuscescentia, nervis lateralibus utrinque 12–14, uti venis pulchre reticulantibus utrinque prominulis; petioli graciles, 8–14 mm. longi. *Racemi* angusti, axillares, 1–2·5 cm. longi, 5–7 mm. lati; bracteae minutae; pedicelli 1–2 mm. longi. *Sepala* rotundato-ovata, 2 mm. longa, minutissime papilloso-ciliolatae. *Petala* elliptico-oblonga, 3–4 mm. longa, basi vix incrassata nec pilosa, superne minutissime ciliolata. *Filamenta* basi in annulum coalita, glaberrima. *Styli* 5, tenues, ovario aequilongi, in alabastro stamina paulo superantes.

Southern New Caledonia. Port Boisé, *Vieillard*, 2336.

Since my synopsis of *Durandea* was drawn up for *Hooker's Icones Plantarum* (see under tab. 3822), I have had, through the courtesy of Professor Lignier of the University at Caen, an opportunity of seeing some further material of that genus. Among it there was the new species described above, a specimen of *D. Lenormandii*, like the one quoted by me *l.c.* p. 2, from Wagap, but numbered '934,' and one, also numbered '934,' of *D. serrata* (*Penicillanthemum neo-caledonicum*, Vieill.). There can, however, be no doubt that Vieillard intended the latter when describing his *P. neo-caledonicum*. In connection with this I may remark that the Kew specimen of Vieillard's No. 934, which I quoted in my synopsis under *D. serrata* consists of two branches, one (*a*) a counterpart of Labillardière's plant, the original of Planchon's *D. serrata*, the other (*b*) absolutely agreeing with the *Penicillanthemum neo-caledonicum* No. 934, of the Caen herbarium. The differences between *a* and *b*, are in the branches of *a* being paler and more lenticellate, in the more olive-brown colour of the underside of the leaves in *a* against the almost chocolate-brown colour in *b*, and in the more attenuate leaf-bases of *a*. There is no difference in the flowers of Labillardière's specimen and of Vieillard's plant. I must, however, add that the former are only represented by fairly mature buds.

D. oreogena was by an oversight omitted in my synopsis of the genus in *Hooker's Icones Plantarum*. It has to be inserted after *D. racemosa*, with the synonym *Hugonia oreogena*, Schlecht. in Engl. Jahrb. vol. xxxix. p. 137, fig. 9 on p. 138, and the following localities :—South-east New Caledonia; slopes of Mt. Humboldt, 1300 m., *Schlechter*, 15350: North-east New Caledonia, hills near Oubatche, 1000 m., *Schlechter*, 15500.

442. **Durandea Lenormandii**, *Stapf* in Hook. Ic. Pl. sub t. 2822 (descr. ampl.) [Linaceae]; a *D. serrata* differt foliis angustioribus plerumque acutis inflorescentiis glaberrimis, sepalis petalisque (in alabastris quidem) ciliatis.

Frutex glaberrimus, ramis multi-lenticellatis. *Folia* lanceolata vel lanceolato-oblonga, acuta vel subacuminata, raro obtusa, basi cuneato-attenuata, 6–10 cm. longa, 0·8–0·3 cm. lata, coriacea, exsiccando fuscescentia, leviter crenulato-serrata, nervis lateralibus utrinque circiter 13, uti venis reticulantibus utrinque prominulis; petioli 6–10 mm. longi. *Paniculae* angustae, 5–6 cm. longae, 1·6 cm. latae, axillares et terminales, ramis ad 1·6 cm. longis

majoribus 3–4-floribus ; bracteae minutae, a basi latiore subulatae ; pedicelli raro ad 2 mm. longi. *Sepala* 3·5–4 mm. longa, albo-ciliata. *Petala* obovato-cuneata, 7 mm. longa, glaberrima, ungue crassiusculo. *Filamenta* glaberrima, tubo 2 mm. longo. *Styli* 5, stamina superantes.

Eastern New Caledonia. On the highest mountains near Wagap, *Vieillard*, 2224 ; 934 in part.

443. **Durandea Deplanchei**, *Stapf* in Hook. Ic. Pl. sub t. 2822 (descr. ampl.) [Linaceae] ; a *D. racemosa* quacum petalis filamentisque basi pilosis congruit, inflorescentia multo graciliore longiore floribus minoribus differt.

Frutex glaberrimus (petalis filamentisque exceptis), ramis crassis cortice brunneo obtectis, gemmis axillaribus resina copiosa indutis. *Folia* oblanceolata, basi longe cuneatim attenuata, crenulato-serrata, 7·5–15 cm. longa, 2·5–5 cm. lata, coriacea, exsiccando fuscescentia, nervis lateralibus utrinque circiter 12–14, uti venis pulchre reticulantibus utrinque prominulis ; petioli 8–20 mm. longi. *Paniculae* angustae, 6–15 cm. longae, 2·5–3 cm. poll. latae, ramis ad 2·5 cm. longis iterum partitis ramulis pauci-floris ; bracteae minutae ; pedicelli graciles, 2–3 mm. longi. *Sepala* 2 mm. longa, explanata multo latiora, minutissime papilloso-ciliolata. *Petala* obovato-cuneata, 6 mm. longa, ungue incrassato piloso (vix villoso). *Filamenta* ima basi tantum coalita, inferne parce pilosa, majora 5 mm. longa. *Styli* 5, tenues, staminibus multo breviores.

Eastern New Caledonia. Near Canala, *Deplanche*.

444. **Durandea viscosa**, *Stapf* in Hook. Ic. Pl. sub t. 2822 (descr. ampl.) [Linaceae] ; a *D. Deplanchei* affini differt foliis longe petiolatis latioribus tenuioribus grossius crenato-serratis.

Frutex glaberrimus (petalis filamentisque exceptis), ramis crassis cortice brumeo obtectis, gemmis resina copiosa indutis. *Folia* elliptico-oblonga, obtusa (?), basi attenuata, crenato-serrata, circiter 40 cm. longa, 7·5–9 cm. lata, tenuiter coriacea, nervis lateralibus utrinque circiter 12, uti venis pulchre reticulantibus utrinque prominulis ; petiolus 5 cm. longus. *Paniculae* angustae, ad 40 cm. longae, ad 3·6 cm. latae, totae resinoso-viscosae, ramis ad 2·5 cm. longis plerumque iterum divisis, ramulis paucifloris ; bracteae minutae ; pedicelli graciles, ad 6 mm. longi. *Sepala* ad 3 mm. longa, albo-ciliata. *Petala* obovata, breviter unguiculata, 5–6 mm. longa, intus supra basin albo-villosa. *Filamenta* inferne intus pilosa, longiora, 5 mm. longa, tubo 1 mm. longo. *Styli* 5, staminibus multo breviores.

Eastern New Caledonia. On hills near Canala, *Vieillard*, 2339.

445. **Durandea vitiensis**, *Stapf* in Hook. Ic. Pl. sub t. 2822 (descr. ampl.) [Linaceae] ; a *D. Jenkinsii* differt foliis minus coriaceis, inflorescentiis gracilioribus, stylis antheras multo superantibus.

Frutex scandens glaberrimus, ramis junioribus angulatis sulcatis exsiccando nigricantibus, vetustioribus cortice pallido obtectis gracilibus, uncis geminatis ad apices ramorum inflorescentias

substituentium quasi pedunculo 9–10 cm. longo suffultis. *Folia* oblonga vel oblongo-elliptica, acuta vel subacuminata, raro obtusa, basi acuta, obscure crenulato-serrata, 7·5–15 cm. longa, 3·5–5 cm. lata, chartacea, exsiccando fuscescentia, nervis lateralibus utrinque circiter 10 uti venis anastomosantibus utrinque prominulis; petiolus 4–12 mm. longus. *Paniculae* angustae, graciles, ad 12 cm. longae, 2·5 cm. (vel terminalis ad 5 cm.) longae, superiores approximatae, ramis simplicibus (paniculae ad racemos reductae) vel iterum divisis, ramulis paucifloribus; pedunculus ad 2·5 cm. et ultra longus; bracteae foliola saepe petiolata 6–8 mm. longa vel in panicula terminali majora referentes; pedicelli graciles, ad 8 mm. longi. *Sepala* 3–3·5 mm. longa, parce albo-ciliolata. *Petala* obovato-oblonga, cuneato-unguiculata, 10 mm. longa, glaberrima, aurea, ungue paulo incrassato. *Filamenta* glaberrima, majora, 4 mm. longa, tubo 1 mm. longo. *Styli* 5, stamina longe superantes, 5 mm. longi.

FIJI. Without precise locality, *Storck*, 4.

446. **Durandea parviflora**, *Stapf* in Hook. Ic. Pl. sub t. 2822 (descr. ampl.) [Linaceae]; affinis *D. vitiensi* sed partibus junioribus minute puberulis, paniculis ovoideis multo latioribus et floribus minoribus differt.

Frutex scandens, inflorescentiis exceptis glaberrimus, ramis junioribus sulcatis gracilibus exsiccando fuscescentibus, uncis geminatis versus apices ramorum aliquorum florigerum circiter ad 10 cm. nudorum indutus. *Folia* elliptico-lanceolata vel oblongo-elliptica, acuta vel acuminata, basi acuta, obscure crenulato-serrata, 7·5–12 cm. longa, 3–5 cm. lata, tenuiter coriacea, exsiccando fuscescentia, subtus pallidiora, nervis lateralibus utrinque 8–10, uti venis reticulatim anastomosantibus utrinque prominulis; petiolus gracilis, 4–8 mm. longus. *Paniculae* ovoideae, pedunculo ad 6 cm. longo suffultae, ad 7·5 cm. longae, ad 5–7·5 cm. latae, sparse minuteque puberulae, ramis inferioribus ad 5 cm. longis ad $\frac{2}{3}$ nudis, ramulis iterum divisis fere corymbulum formantibus, superioribus multo brevioribus racemose paucifloris; bracteae axis primariae inferiores vel omnes foliola parva referentes, ramorum subulatae, 3 mm. longae; pedicelli ad 3 mm. longi. *Sepala* 2 mm. longa, vix ciliolata. *Petala* anguste obovato-cuneata, ad 5 mm. longa, glaberrima, unguibus incrassatis. *Filamenta* glaberrima vel interdum pilis perpaucis basin versus conspersa, majora paulo ultra 2 mm. longa tubo brevissimo. *Styli* 5, graciles, 3 mm. longi.

SOLOMON ISLANDS. Probably New Georgia, *Officers of H.M.S. Penguin*.

447. **Sageretia Henryi**, *J. R. Drumm. et Sprague* [Rhamnaceae]; habitu similis *S. hamosae*, Brongn., a qua foliis minoribus, nervis lateralibus pro rata paucioribus, rhachi inflorescentiae glabriuscula et floribus pedicellatis recedit.

Frutex alte scandens. *Internodia* longiora 2–5 cm. longa, brevioribus alternata. *Folia* oblongo-lanceolata vel lanceolata, acuminata, acumine 1–2 cm. longo, 5–10 cm. longa, 2–3·5 cm. lata, inferiora elliptico-ovata minora, supra nitidula exsiccando subcastanea crebre reticulata, subtus opaca viridula, nervis supra leviter impressis, subtus prominentibus; petioli 5–10 mm. longi. *Stipulae*

subulatae 1–1·5 mm. longae. *Thyrsi* simplices, stricti, 3–7 cm. longi, in axillis superioribus geminati, rarius solitarii, rhachi minute puberula ; cymulae sessiles, 1–5-florae, 3-10 mm. inter se distantes ; pedicelli 1·5–2 mm. longi. *Calycis lobi* ovato-deltoidei, 1·5 mm. longi, basi 1·3-1·5 mm. lati. *Petala* alba (fide *Henry*), 1 mm. longa, anthesi perfecta quam stamina paullo breviora. *Stamina* calycis lobis breviora. *Ovarium* depresse trigono-globosum, 3-loculare. *Drupae* immaturae obovoideae, 5 mm. longae, rubrae (fide *Henry*), pyrenas 3 includentes, quarum 1 minore abortiva.

China. Yunnan ; Mengtze, on a wooded cliff, at about 1,600 m., *Henry*, 11240. Szechuan ; N. Wushan, *Henry*, 7118 ; Mount Omi, 1,200 m., *Faber*, 143. Hupeh ; *Henry*, 5340.

448. **Sageretia gracilis**, *J. R. Drumm. et Sprague* [Rhamnaceae]; affinis *S. parviflorae*, G. Don, a qua floribus majoribus magis aggregatis, sepalis pro rata angustioribus, foliorum venatione recedit ; ab *S. oppositifolia*, Brongn., olim ab auctoribus cum *S. parviflora* confusa, panicula ampliore glabriuscula ramis elongatis gracilibus facile distinguitur.

Frutex vagans vel scandens. *Internodia* longiora 1–5 cm. longa. *Folia* ovata usque lanceolata, saepius breviter acuminata, obtusa vel acuta, nervo medio in apiculum excurrente, basi obtusa vel rotundata, 4–7 cm. longa, 2–3 cm. lata, supra nitidula exsiccando intense viridia vel subfusca, crebre reticulata, subtus opaca, nervis supra leviter impressis subtus prominentibus ; petioli 5–7 mm. longi. *Stipulae* subulatae, 1–2 mm. longae. *Panicula* terminalis, floribunda, 15–30 cm. longa, rhachi superne necnon rhachillis minute pubescentibus ; rami primarii patentes 4–12 cm. longi, inferiores foliis vel bracteis foliaceis gradatim minoribus suffultae, ramos secundarios patulos 1–4 in parti inferiore gerentes, superiores bracteis stipuliformibus suffultae ; cymulae sessiles, 1–5-florae, 2–6 mm. inter se distantes, floribus sessilibus. *Calycis lobi* ovati vel triangulari-ovati, 1·3–1·5 mm. longi, basi circiter 0·8 mm. lati. *Petala* alba (fide *Henry*), circiter 0·8 mm. longa, quam stamina breviora. *Stamina* calycis lobis breviora ; antherae apiculatae. *Ovarium* 2–3-loculare. *Drupae* rubrae (fide *Henry*), 6–7 mm. longae, pyrenis 2 vel 3, quarum 1 minore abortiva, oblique obcordatis 5–6 mm. longis, 4·5 mm. latis.

China. Yunnan ; Mengtze, in woods, 1400–1600 m., *Henry*, 10144 (flower), 10144 A (fruit).

449. **Sageretia compacta**, *J. R. Drumm. et Sprague* [Rhamnaceae]; peraffinis *S. gracili*, nob., a qua foliis anguste lanceolatis; panicula coarctata pluries minore, floribus versus apices ramulorum compactis, staminibus sepala aequantibus differt.

Internodia longiora 0·6–1·5 cm. longa. *Folia* anguste lanceolata, acuta, vel obtusa et apiculata, basi obtusa vel rotundata, 4–7·5 cm. longa, 1·7–2·4 cm. lata, supra nitidula exsiccando subcastanea crebre reticulata, subtus viridula reticulatione manifesta nervis lateralibus prominulis, nervo medio supra leviter impresso subtus prominente ; petioli 4–7 mm. longi, *Stipulae* subulatae, 1·5–2 mm. longae. *Panicula* terminalis, 9 cm. longa, rhachi minute puberula ; rami primarii patuli, 1–4 cm. longi, inferiores ramos secundarios 2

in parte inferiore gerentes ; cymulae sessiles versus apices ramorum dense aggregatae, floribus sessilibus. *Calycis lobi* triangulari-ovati, tandem leviter deflexi, 1·5–1·75 mm. longi, basi 1–1·3 mm. lati. *Petala* 1·5 mm. longa, quam stamina breviora. *Stamina* calycis lobos aequantes. *Ovarium* 2-loculare. *Drupae* haud visae.

CHINA. Yunnan ; *Ducloux*, 601.

450. **Acer Tutcheri**, *Duthie* [Aceraceae] ; species *A. Campbellii* affinis, sed foliis 3–sub-5-lobis, magis coriaceis et panicula breviore differt.

Arbor parva, cortice ramulorum bruneo-purpureo. *Folia* 3–raro sub-5-lobis, 6–7 cm. longa, 8–11 cm. lata, praeter venarum primariarum axillas omnino glabra, basi rotundato-truncata vel aperte cordata, subintegra, lobis triangularibus, acutis vel acuminatis, apicem versus argute serrulatis. *Paniculae* 3–4 cm. longae. *Flores* cum foliis coetanei, 4-meri. *Sepala* 2·5 mm. longa, oblonga, obtusa. *Petala* 1·5 mm. longa, obovata. *Ovarium* dense albo-pilosum. *Samarae* 2 cm. longae, angulo obtusissimo divergentes.

CHINA. Kwantung ; Lantas Island, *W. J. Tutcher*.

The discovery of this new maple is not only of great interest in adding one more species to the limited number representing the genus in tropical regions, but also from the fact of its close affinity to a common Eastern Himalayan species. Besides *A. niveum*, which extends from Assam to the Malay Archipelago, there are at Kew two other species, both of which are undescribed, one collected by Haviland in Borneo, and the other collected by Harmand in Annam. All three have undivided laurel-like leaves with entire margins, resembling the foliage of the common Himalayan *A. oblongum*, which occurs most abundantly in the hotter parts of that range, descending as low down as Dehra Dun.

451. **Astilbe virescens**, *Hutchinson* [Saxifragaceae-Saxifrageae] ; *A. rivulari*, Ham., affinis, sed foliolis glabris marginibus crenatis et staminibus 10 differt.

Folium biternatum, rhachi primaria supra levisissime canaliculata, rhachi secundaria basi pilis longis praedita ; petiolulo terminali 5–6 cm. longo, petiolulis lateralibus 1–5 cm. longis ; foliola oblique cordata, acute acuminata, 9–11 cm. longa, 6–9 cm. lata, crasse crenata, crenis denticulatis, denticulis rubris, utrinque glabra ; venae utrinque 5–6, supra impressae, subtus prominentes. *Panicula* ramosissima, pyramidata, ramis divaricatis glanduloso-pubescentibus ; bracteae lanceolatae, membranaceae, bracteolis parvis. *Flores* hermaphroditi, parvi, pedicellati. *Sepala* 5, elliptica, 2 mm. longa, 1 mm. lata, viridia, glabra, supra concava, apice minute bifida. *Petala* nulla. *Stamina* 10, filamentis gracilibus 4 mm. longis glabris ; antherae parvae, rotundatae. *Carpella* 2, glabra, infra medium connata.

CHINA. Without precise locality.

Described from a living specimen communicated by Messrs. James Veitch & Sons, who raised it from seeds collected by Mr. E. H. Wilson.

The flowers of this species are of a pale green colour, and are very sweet-scented.

452. **Passiflora** (§ Decaloba-Polyanthea) **altebilobata**, *Hemsl.* [Passifloraceae] ; inter species sinenses *P. Franchetianae*, Hemsl., proxima, a qua parvitate, foliis ultra medium bilobatis a basi trinerviis, fructu minore et seminibus leviter rugulosis recedit.

Frutex vel herba scandens, parva, pubescens, ramis floriferis gracillimis ; internodia foliis breviora. *Folia* petiolata, tenuia, glabrescentia, ambitu ovata, absque petiolo 3–9 cm. longa, ultra medium bilobata, sinu aperto rotundato unisetuloso ; lobi oblongi, divergentes, acuti ; petioli graciles, 1–2 cm. longi, biglandulosi. *Cirrhi* simplices, graciles, quam folia multo breviores. *Flores* albi, circiter 1 cm. diametro, in cymas parvas axillares subsessiles dispositi, extus puberuli, graciliter breviterque pedicellati. *Sepala* et *petala* similia, fere aequalia, oblonga, obtusa. *Corona faucialis* duplex ; coronae filamenta omnia filiformia, exteriora petalis paulo breviora, interiora dimidio breviora. *Corona interior* annularis, margine incurva, irregulariter fimbriato-dentata. *Discus* cupuliformis. *Ovarium* ovoideum, glabrum, gynophoro brevi. *Fructus* globosus, glaber, 1–1·2 cm. diametro, gynophoro circiter 5 mm. longo. *Semina* lenticularia, circiter 4 mm. diametro, leviter rugulosa.

China. Yunnan ; Szemao, at 1200–1500 m., *Henry*, 12987, 12987 A.

453. **Passiflora** (§ Decaloba-Polyanthea) **Wilsoni**, *Hemsl.* [Passifloraceae] ; species ex affinitate *P. cupuliformis*, Mast. et *P. Henryi*, Hemsl. ; haec foliis basi rotundatis lobis acuminatis et floribus majoribus glabris, illa foliis arcuato-truncatis et floribus cymosis differunt.

Frutex glaber, alte scandens ramis floriferis gracilibus sulcatis ; internodia quam folia breviora. *Folia* petiolata, tenuia, basi late rotundata, apice truncato-trilobata, lobo intermedio fere obsoleto, 5–10 cm. diametro, latiora quam longa, utrinque 3-nervia, subtus pallidiora ; lobi laterales acuminati ; petioli graciles, eglandulosi, 3–6 cm. longi. *Cirrhi* simplices, graciles, usque ad 15 cm. longi. *Flores* circiter 3 cm. diametro, cymosi, graciliter pedicellati ; cymae saepius in foliorum axillis binae, usque ad 9-florae, petiolos vix superantes. *Bracteolae* minutae. *Sepala* et *petala* similia, ovato-oblonga, obtusiuscula. *Corona faucialis* duplex ; filamenta omnia filiformia, quam petala tertia parte breviora, interiora exterioribus circiter dimidio breviora. *Corona interior* erecta, multiplicata. *Discus* cupuliformis. *Ovarium* glabrum, globosum, gynophora petalis breviore. *Fructus* ignotus.

China. Yunnan ; Szemao, at 1500 m., *Henry*, 11791.

Dr. Henry's 9820 from Mengtze is probably a barren branch of this species.

454. **Senecio homogyniphylla**, *Cummins* [Compositae-Senecionideae] ; species habitu *Homogynem alpinam*, Cass., quam maxime referens, nulli speciei *Senecionis* manifeste affinis, phyllorum apicibus herbaceis et pappi absentia distincta.

Herba scapigera. *Rhizoma* fibris pilisque vestitum. *Folia* longe petiolata, reniformia, marginibus leviter repando-dentata, 2–3 cm. longa, 2·2–4 cm. lata, palmatim 8-nervia, nervis primariis in mucronem minutum excurrentibus, lamina utrinque sparse pilosa, infra saepe purpureo-variegata ; petiolus 2–2·5 cm. longus, fulvo-villosus, imprimis basin versus. *Scapus* 1-cephalus, 16–24 cm. longus, tenuis, sulcatus, sparse pilosus, bracteis 1-pluri-linearibus instructus. *Capitula* flava, 2 cm. diametro ; *involucrum* glabrum, supra medium constrictum, *phyllis* 7–10 imbricatis, exterioribus oblongo-linearibus subacutis, interioribus ellipticis obtusis, omnibus infra medium dorso incrassatis ochraceis, supra herbaceis viridibus purpurascentibus. *Flores* lutei, *radii* feminei, ligulati ; *disci* hermaphroditi, corollis tubulosis campanulatis 5-fidis segmentis recurvatis. *Styli rami* recurvati, truncati, penicillati. *Achenia* ovato-oblonga, glabra, 2 mm. longa, epapposa.

Western China. On rocks, without precise locality, *Wilson*, 3783.

455. **Senecio eriopoda,** *Cummins* [Compositae-Senecionideae] ; species scapigera foliis ovato-cordatis, novellis uti scapo inferiore densissime villoso-lanatis.

Herba scapigera. *Rhizoma* fibris pilisque dense vestitum. *Petioli* ad basin etiamque gemmae foliorum similiter obtecti. *Folia* saepe 2, ovato-cordata, acuta, mucronata, sinuato-dentata, 6–10 cm. longa, 4–8 cm. lata, 7-nervia, subtus tomento sordide argenteo appresso vestita, supra pilis sericeis deciduis instructa ; petiolus 5–22 cm. longus, pilosus. *Scapus* pilosus, flexuosus, 36 cm. longus, plerumque ad vel infra medium ramum corymbuliferum emittens. *Corymbi* 2–5 cm. lati, pedunculi 3–4 cm. longi ; bracteae circiter 2 cm. longae. *Capitula* 2 cm. diametro, radiata ; *phylla* circiter 8, 6–8 mm. longa, 1·5–2 mm. lata, sub anthesi tomentosa, deinde glabrescentia, marginibus scariosis. *Flores radii* feminei, ligulati, 3-dentati, 8–15 mm. longi ; *disci* tubulosi, 5-fidi, 11 mm. longi. *Styli rami* recurvati ; stigmata apice subdilatata, penicillata. *Achenia* circiter 3·5 mm. longa, pappo corolla aequilongo vel breviore.

China. Patung ; without precise locality, *Wilson*, 235 ; W. Hupeh ; *Wilson*, 235a.

There are two gatherings of this plant, both made in April. In one the leaves are borne on petioles up to 22 cm. long, the peduncles are 3–4 cm. long, the flowers are past pollination with the anthers empty and the style arms recurved. In the other gathering the leaves have much shorter petioles, about 5 cm. long, and are much firmer. The peduncles are short and the inflorescence consequently contracted, whilst most of the flowers are still unopened and the anthers are full of pollen. The other characters agreeing, the two specimens would appear to represent different stages of one species, one still having its autumnal leaves, the vernal leaves in bud and the flower heads just beginning to open ; the other with the autumnal leaves dropped, the vernal leaves developed and the flowers past pollination.

456. **Anaphalis viridis**, *Cummins* [Compositae-Inuloidae]; affinis *A. xylorrhizae*, Sch.-Bip., sed foliis ovato-rotundatis, capitulis majoribus et phyllis latioribus differt.

Fruticulus humilis, procumbens, undique lana viridi-lutescente dense vestitus. *Rhizoma* crassiusculum, apice ramosum, multiceps. *Folia* 6–10 rosulatim disposita, sessilia, ovato-rotundata, interdum mucronata, circiter 2 cm. longa, 1–2 cm. lata. *Scapus* crassiusculus, vix 12·5 cm. longus, valde lanatus; bracteae 1–3, lineares vel oblongae. *Capitula* 5–10, 1–2 cm. lata, in glomerulum sublaxum conferta; *phylla* circiter 15, ovata, subacuta, 2–9 mm. longa, basi nigrescentia, supra scariosa, nivea. *Pappus* fragilis, caducus.

China. Szechuan; without precise locality, *Henry*, 8922; Tachienlu, 2700–3900 m., *Pratt*, 314; without precise locality, *Wilson*, 3820.

457. **Saussurea acroura**, *Cummins* [Compositae-Cynaroideae]; affinis *S. japonicae*, DC., a qua foliorum lobo terminali lineari-lanceolato et phyllis apice insigniter albo-villosis recedit.

Herba suffruticosa, caule simplici sulcato, circiter 70 cm. alta. *Folia* omnia sessilia, 8–16 cm. longa, 4–8 cm. lata, subtus ad nervos primarios pilosa, supra hirsuta, pilis rigidis appressis, marginibus ciliata, basi auriculata auriculis dentatis vel acute lobatis, pinnatisecta, 6–8-juga, segmentis lateralibus oblanceolatis integris mucronatis circiter 4 cm. longis 1–5 cm. latis, terminali lineari-lanceolato saepissime 5–6 cm. longo. *Bracteae* inferiores foliaceae, superiores lineari-lanceolatae. *Corymbi* stricti. *Capitula* 10 mm. longa, 4 mm. lata, circiter 4-flora; *phylla* dorso marginibusque sparse lanata, obtusa, apice insigniter albo-villosa, breviter mucronata.

Western China. Without precise locality, at 2000 m. *Wilson*, 3894.

458. **Oreocharis** (§**Stomactin**) **aurea**, *Dunn* [Gesneriaceae]. In sectione corollae lobis brevibus distincta.

Herba scaposa, perennis, 20–40 cm. alta. *Folia* omnia radicalia, ovata vel oblongo-ovata, 8–14 cm. longa, grosse bicrenata, chartacea, supra omnino, subtus in venis tantum plus minusve dense hirsuta, acuta, basi leviter rotundata vel secus petiolum in alas irregulares breviter producta, venis crebris ascendentibus, petiolis molliter hirsutis, laminas aequantibus vel eis brevioribus. *Scapa* 20–40 cm. alta, apice in cymam irregularem multifloram bracteatam elaborata, tenuiter hispida, bracteis oblongis, plus minusve incisis. *Flores* flavi. *Calyx* ad basin 5-partitus, lobis linearibus obtusis 8–10 mm. longis molliter hirsutis. *Corolla* tubularis, supra medium constricta, 16–18 mm. longa, extus puberula, lobis 5, 4 superioribus erectis, 1 inferiore reflexo, ovatis imbricatis. *Stamina* 4, corolla duplo breviora, in paribus distantia, ovario excedentia. *Stylus* brevis, stigmate explanato cupulari. *Capsula* 3–4 cm. longa, 5–6 mm. lata, linearis, apice acuta, stylo cupulari persistente; semen minutum ellipticum utrinque acutum.

China, Yunnan; Feng Chen Tin Mts., on trees in the forest at 2000 m.; Mengtze, Mts. to S.E. in forests at 1500 m.; south of the Red River from Manmei at 2000 m., *Henry*, 9713, 9713 A–C.

459. **Corytholoma macropodum**, *Sprague* [Gesneriaceae]; habitu *C. canescenti*, Fritsch, similis, indumento necnon glandulis disci omnibus evolutis facillime distinguitur.

Tuber depresso-globosum, circiter 2 cm. altum, 3 cm diametro. *Caulis* simplex, erectus, teres, 8–9 cm. longus, circiter 6 mm. diametro, paria duo foliorum gerens, internodio 5–7 cm. longo, ut petioli, pedunculi, pedicelli, calyces extra pilis glanduloso-capitatis et paucis eglandulosis patenter hirsutus. *Folia* suborbicularia, basi leviter cordata, apice rotundata, 8–9 cm. diametro (inferiora 6–7 cm.), obtuse serrata, dentibus in hydathodia purpurea terminantibus, densiuscule ciliata, supra nitidula, pilis erectis glandulosis inspersis, venis impressis, subtus venis et venulis valde prominentibus densiuscule hirsutis, pilis plerumque eglandulosis, mesophyllo glabro; petioli 1–2·5 cm. longi. *Cymae* in axillis solitariae, pedunculo 5–8 cm. longo, floribus leviter pendulis pseudo-umbellatis saepius quinque, pedicellis 1–2 cm. longis. *Calyx* intus nitidulus, subappresse puberulus; tubus 0·5 mm. longus; lobi ovati, acuminati, 4·5 mm. longi, 2·25–3 mm. lati. *Corolla* pallide cinnabarina; tubus 2·5–3 cm. longus, fere cylindricus, basi annulatim inflatus, superne leviter ventricosus, extra densiuscule pubescens; limbus 1·5 cm. latus; lobi patuli, transverse elliptici, inferiores rubro-maculati, 7–8 mm. lati, 5–6 mm. longi, superiores minores haud maculati. *Disci glandulae* omnes evolutae, circiter 1 mm. altae, duae posticae in ephippium basi 4 mm., apice 2·5 mm. latum (explanatum) connatae; duae laterales et antica liberae. *Ovarium* pilis acutissimis ascendentibus densiuscule pubescens, stylo circiter 2 cm. longo glanduloso-puberulo, stigmate albo-papilloso; placentae bilaminatae.

BRAZIL. Raised from seed received in 1906 from the Botanic Garden, São Paulo.

C. macropodum is evidently closely allied to *C. canescens*, Fritsch, although it differs from the latter in a character which was regarded by Hanstein (in Martius, *Flora Brasiliensis*) as of sectional importance, namely the presence of all five glands of the disc. The corolla is very like that of *C. rupicola*, Fritsch, and the leaves are of much the same shape as in *C. latifolium*.

It may be noted that the name *Corytholoma* should be used for the genus which commonly passes in gardens under the name *Gesnera*, and that the true *Gesneria*, Linn., is what has been called *Pentaraphia* or *Conradia*. The confusion of names arose through the action of Martius (*Nova Genera et Species*, vol. iii., p. 27) in rejecting the name *Gesneria* for the group to which it was applied by Linnaeus, and in using it in the modified form *Gesnera* for a new genus of his own.

Full reasons for the adoption of the name *Corytholoma*, in preference to *Rechsteinera*, are given by Fritsch in *Bih. Svensk. Vet. Akad. Handl.*, vol. xxiv., No. 5, p. 20.

460. **Beloperone angustiflora**, *Stapf* [Acanthaceae]; affinis *B. violaceae*, Planch. & Lind., sed foliis angustioribus, bracteis late-obovatis apice rotundatis, corollis tubo multo angustiore limbo minore distincta.

Herba perennis, dichotome ramosa; caulis ramique praeter lineas duas tenues pubescentes glabri, ad nodos paulo incrassati. *Folia* oblongo-elliptica vel superiora anguste oblonga vel sublinearia, utrinque acuta, integra, 3–7 cm. longa, 0·7–1·7 cm. lata, supra obscure viridia, in sicco cystolithis numerosissimis albo-striolulata, costa albo-pubescente, praeterea sparse pilosula, subtus pallidiora, in nervis laxe pubescentia, nervis tenuibus; petioli tenues, foliorum intermediorum 6–10 mm. longi, summorum multo breviores. *Inflorescentiae* terminales et ex foliorum summorum axillis, sub anthesi capituliformes, deinde elongatae, densae; bracteae late obovatae, apice rotundatae, basi cuneatim attenuatae, 8 mm. longae, ad 6 mm. latae, supra sparse pilosae, subtus dense minute glanduloso-pubescentes, circumcirca longe ciliatae; bracteolae oblanceolatae, bracteis fere aequilongae, indumento simili indutae. *Calyx* ad basin 5-partitus, segmentis linearilanceolatis acutis 5 mm. longis apice tantum pubescentibus marginibus anguste hyalinis. *Corolla* extus puberula, tubo angusto albido 12–14 mm. longo, limbo purpureo-violaceo; labium superum 4–5 mm. longum, minute bilobum; labium inferum 6–7 mm. longum, profunde 3-lobum, lobis divaricatis, lateralibus quam intermedio paulo angustioribus, hoc in fundo maculo albo-pinnato ornato. *Antherae* ad medium labii superioris adscendentes, albae, connectivo latiusculo, thecis inaequaliter affixis, inferiore basi acuta. *Stigma* breviter 2-lobum. *Capsula* clavata, mucronato-acuta, 8 mm. longa, medio in stipitem latiusculum contracta. *Semina* 4, discoidea, minute granulosa, fusca, 1·5–1·7 mm. diametro. *Radicula* leviter curvata, cotyledonibus apposita.

TROPICAL AMERICA. Locality unknown. Raised at Kew from seed received from the Jardin des Plantes, Paris, in 1903.

IV.—AUSTRALIAN GRASSES.

Mr. Fred. Turner, F.L.S., has contributed several interesting articles on Australian plants of economic interest to the *Sydney Morning Herald* during the past year. With the object of making them more generally known, two of them, dealing with the native grasses of Australia, are reprinted here by kind permission of the proprietors of the *Herald* (Sir James Fairfax and Sons). The first article was published on May 28th and the second in the issue of June 13th, 1907.

AUSTRALIAN GRASSES.—I.

Recovery of Native Pastures.—Before the breaking of the last disastrous drought several pastoralists, with much experience of the western country, expressed to me their fears that many of the indigenous grasses had disappeared for ever, and that the grazing areas would in consequence always remain in an indifferent condition, as any plants that survived such unprecedented dry weather would never recover sufficiently to provide valuable pasture herbage for stock. That was the verdict given about much of the

ordinary class of pastoral country, whereas the areas from which the loose surface soil had been blown by wind storms were regarded as irreclaimable "miniature Saharas," as it was asserted that both grass roots and grass seeds had been removed with the soil. At that time I reminded those stock-owners of the wonderful recuperative powers of Australian grasses, of the remarkable vitality of their seeds, and of the depth to which they naturally penetrate the soil, and predicted that after the land had received a good soaking rain the plants would recover, and if they did not regain their pristine vigour, would certainly, with careful and judicious grazing, eventually produce valuable pasture herbage, which would support millions of sheep and other herbivora. My ideas were considered too optimistic then, when it was the fashion to indulge in so much pessimistic talk.

A short time after the breaking of the drought I was botanising in the western country, and saw, as I had previously predicted, millions of acres covered with beautiful verdure that gladdened the heart of the stock-owner. On those at one time almost desert-like tracks the grasses were three feet high or more, and most of the country resembled a magnificent wheat-field just coming into ear. One pastoralist remarked, "It is seven years since I saw a blade of kangaroo grass (*Anthistiria ciliata**), and look at it now." Some of the plants which I measured were four feet three inches high. Another observant grazier in a different part of the West pointed out to me seven species of grass which he had never before seen growing on his station during the fourteen years he had been in possession ; and several other stock-owners in various parts of the West gave similar information, and thought the occurrence very remarkable. Those are practical proofs of the wonderful vitality of Australian grass seeds. The seeds must have lain dormant for many years, and when the earth and atmospheric conditions were favourable germinated, and subsequently developed into such fine plants as to make them conspicuous objects in the pastures, and easily recognisable by pastoralists as distinct from those they had been accustomed to see. For some months after the breaking of the drought I received for identification scores of specimens of grasses, especially from those parts where heavy rain had fallen, and many were marked "never observed before" or "never previously seen," and were thought to be quite new to the country. If all such specimens had been unknown to botanists I should have had to name and describe a number of new species, and add them to the already rich and unique indigenous flora of the West. The above facts are very suggestive, and clearly prove the truth of my remarks made at the beginning of this article.

Many Australian grasses have bulbous or thick, knotty bases, which no doubt are provided by nature for storing up food to sustain the plants during very dry weather, and to preserve them from extinction. In adverse seasons, and during prolonged droughts, when every vestige of grass foliage has disappeared, these swollen bases, which are generally enveloped in a woolly substance to prevent evaporation, and their strong, long fibrous roots,

* Probably *A. imberbis* Retz. (*Themeda Fors-Kalii*, Hack.) Ed.

which penetrate deeply into the earth, remain alive but dormant until the condition of the soil and weather are favourable for them to again put forth green leaves. In January after a heavy fall of rain, I have seen the dormant, woolly, swollen bases of the "tall oat-grass" (*Anthistiria avenacea*) develop leaves, and in four months plants more than six feet high, producing a remarkable amount of rich succulent herbage. This occurred on some of the country west of the Darling River, but on the black soil plains near Moree I have seen that fine grass nearly nine feet high, and that wonderful growth was made in less than five months after heavy summer rain followed by favourable weather. Several species, peculiar to the black country, of the genus *Eragrostis* have large bulbous bases from which a quantity of leafy herbage develops after rainfall, no matter how prolonged the previous dry weather may have been. *Eragrostis eriopoda* and *E. laniflora* are very remarkable plants in that particular. An allied species *E. lacunaria*, is popularly called "never fail" by stockmen, on account of the phenomenal amount of dry weather it can endure. One of the "mulga" grasses, *Danthonia bipartita*, has a large bulbous base and strong fibrous roots, which enable the plant to withstand the torrid heat of Central Australia. After rain quite a number of growths, generally not more than one foot and rarely exceeding two feet in height, are produced from its base and remain vividly green for a considerable time, even if a long period of dry weather ensues. The Mitchell grasses, *Astrebla* spp., which occupy large tracts of country in the interior, have thick, knotty bases, which together with their strong wiry roots, which penetrate deeply into the ground, remain in a dormant condition during protracted droughts, but readily start into growth after a good rainfall. These valuable pasture grasses, more particularly *Astrebla elymoides*, have a branching habit, and in an ordinary season a good shower of rain, such as results from a thunderstorm, will cause new growth to sprout prolifically from the joints of the stems, which are soon covered with a mass of green, nutritious herbage. The above are only a very few of the many instances which could be given to illustrate the wonderful recuperative powers of indigenous grasses.

Vitality of Grass Seeds.—Most Australian grasses, when allowed to grow undisturbed for a time, produce an abundance of seeds which, when mature and kept in contact with dry earth, retain their germinating power for a lengthy period. Several species produce seeds which are comparatively large, when judged by the size of those of cultivated cereals, and which at one time formed an important article of food for the aborigines. The ripe seeds of many indigenous grasses are enclosed in very hard coverings with the lower portions prolonged into points, some being very sharp, notably those of the species of the genera *Aristida* and *Stipa*, popularly called "three-awned spear" and "spear" grass respectively. When these mature seeds fall perpendicularly, which they frequently do, to the ground, they penetrate it, and gradually descend several inches, especially if it is deep and loose. The sharp, pointed seeds, of the "tall oat-grass" have been found nearly a foot below the surface, so that it will be easily understood that although a few inches of surface soil may be removed by

strong winds, the lower stratum or subsoil is often thickly studded with seeds of various species of grass. This method of sowing grass seed is one of the many devices Dame Nature adopts for perpetuating plants under adverse climatic conditions. When good rains fall on those naturally-sown areas, and genial weather ensues, the seeds germinate quickly, and the resulting grass grows rapidly, and soon clothes apparently useless tracts of country with beautiful verdure. Those areas, however, which have a substratum or subsoil of a hard or strong clayey nature, and from which the surface soil has been removed by wind, do not quickly become covered with grass after rain and congenial weather for the seeds, however sharp the points of their coverings may be cannot penetrate that as easily as the more porous earth ; consequently there are few, if any, naturally-sown seeds to germinate. Such areas often remain destitute of grass for a considerable time, and in the interior are generally called "scalded plains." After the sun and weather have ameliorated the surface, and made it congenial to plant life, vegetation gradually reasserts itself on those areas, which eventually become covered with beautiful green grass and other herbage.

Distribution of Grass Seeds.—The distribution of Australian grass seeds by natural and artificial means is a most interesting study, and anyone with a little leisure can occupy himself in a most delightful way by noting how the matured seeds are often disseminated. The plumose awns (hairy tufts) surmounting the coverings of the seeds of such species of the genus *Pappophorum* as *P. avenaceum* and *P. nigricans* are wafted hither and thither by the wind in the same way as the fruitlets, with their adherent pappus, of some Composites, and are often deposited some distance from the plants that bore them. Many grass seeds, especially those whose coverings are clothed with clinging hairs, and those whose flowering glumes have long awns, are often distributed far and wide by various agencies, particularly by travelling stock, which, when camped, sometimes unconsciously bury the seeds in the ground, where they lie until rain falls in sufficient quantities to cause them to germinate. I know of an instance where the seeds of one of the "mulga" grasses (*Neurachne Mitchelliana*) were carried by cattle several hundred miles, and deposited in deep, soft soil on the camping-ground, where they germinated after heavy rain, and grew luxuriantly amongst the surrounding dissimilar vegetation. It is not generally known that the vitality of many grass seeds is not impaired by the process of digestion ; indeed, the germination of many of the hard-coated ones is facilitated.

The grasses referred to in this article are only typical of a number of others, for it must be obvious that interesting particulars about all the native grasses, or even a small percentage of them, could not be mentioned in the space at disposal.

Australian Grasses.—II.

Economic Value in the Pastures.—As far as is at present known, there are 367 species and many well-defined varieties of grass indigenous to Australia, and they are fairly well distributed over

the continent, quite a number occurring on the so-called desert tracts of Central Australia. All these grasses are not endemic, for many of them are found growing in other warm countries, and several are widely distributed in various parts of the globe. The endemic grasses have a unique position among the vegetable products of the earth, for, in addition to many of them possessing singular characteristics, they include one of the dwarfest and one of the tallest species in the world. The former (*Micraira subulifolia*), which I found on the Glass House Mountains in Queensland, where it forms a dense carpet on the shelving rocks, has very narrow leaves, usually about a quarter, but rarely half, an inch long, and thread-like flowering stems from one inch to two inches high, while the latter, popularly called the "climbing bamboo," has stems more than 200 feet long, which ascend to the tops of the highest trees in tropical Australia. Several indigenous grasses, such as *Festuca divesa*, *Heteropogon insignis*,* *Panicum crus-galli*, *Rottboellia exaltata*, *Sorghum fulvum*,† etc., attain a height of from 8 feet to 12 feet or more, but by far the greater number grow, under normal conditions, from 1 foot to 4 feet high. Together with the famous saltbushes, nutritious herbs, and the many shrubs and trees producing edible and palatable foliage, all of which will be referred to in subsequent articles, they are the most valuable assets on this continent. Without that rich and varied vegetation, it would be practically impossible to feed the millions of sheep, cattle, and horses now depastured in this country. Commercial men frequently make the remark, "What would Australia do without its wool?" But very few ever pause to think what Australia would do without the indigenous herbage which is really the principal factor in creating this valuable staple product. When it is taken into consideration that the pastoral industry is worth about £250,000,000, and yearly increases in value, being the most important one in Australia, and the one from which the population derives its greatest wealth, it is a matter of national importance that more attention should be paid to the valuable indigenous herbage and to the means of saving it from deteriorating in places and of preserving some of it from extinction. Having travelled more than 50,000 miles in Australia, and critically examined much of the indigenous vegetation in all the States of the Commonwealth and in other countries, and having cultivated upwards of one hundred species of Australian grasses in conjunction with those of Europe, Asia, Africa, and America, to test their qualities by comparison, I can conscientiously say that no part of the world possesses richer and more varied pastoral vegetation than Australia, but careful attention and judicious stocking are required in order to obtain the best results.

Early appreciation.—Australian grasses attracted the attention of the discoverers and earliest settlers of this continent, and different views were entertained regarding their economic value. Sir Joseph Banks, to whom Australia is so much indebted for its early settlement, and for the development of its vegetable resources, remarked in one of his papers :—"The herbage of the colony is

* *Festuca dives* (= *Glyceria dives* of Fl. Austral.), probably a *Poa*; *Heteropogon insignis* (= *Andropogon triticus* R. Br. of Hackel's monograph).—Ed.

† *Andropogon serratus* of Hackel's monograph.—Ed.

by no means so well adapted to sheep farming as that of Europe, and, therefore, the progress of the flocks will be slow." This opinion, however, was soon controverted, for Captain Waterhouse, in writing to Captain Macarthur in the early part of the last century, mentioned that he had kept sheep, and found them do well on the natural pasturage, and he believed that good pasturage would be found for any number of sheep that might be raised. He therefore ridiculed the idea of artificial grasses being necessary. The opinions entertained by Captain Waterhouse one hundred years ago have been amply verified by subsequent experience. Australian explorers always took much interest in the indigenous grasses which, when abundant, relieved them of much anxiety in providing ample feed for their horses and the stock that travelled with them. Sir Thomas Mitchell, exploring in the interior, collected specimens of grasses, and afterwards wrote an interesting account of the manner in which the aborigines gathered the Australian millet (*Panicum decompositum*), the seeds of which formed for them an important article of food. He writes, *inter alia* :—"The grass had been pulled up to a very great extent and piled in hay-ricks, so that the aspect of the desert was softened into the agreeable semblance of a hay field. The grass was beautifully green beneath the heaps, and full of seeds, and our cattle were very fond of this hay." This native millet is found in greater or less abundance over the whole of Australia. On the margins of rivers and creeks it attains sometimes a height of four feet, but on the plains in the interior it rarely exceeds two feet. It yields a most nutritious herbage, of which stock of all kinds are remarkably fond, and on which they fatten. When brought under cultivation, the Australian millet is a most productive grass, and has yielded three tons of excellent hay per acre. There are 56 known indigenous species of the genus *Panicum* widely distributed, and most of them form a good percentage of the pasture-herbage, and are most valuable forage plants. Many of these grasses withstand a phenomenal amount of dry weather, and are amongst the first to develop new growth after rain.

Blue grass.—Pastoralists call several species "blue grass," and one of the best and most nutritious is *Andropogon sericeus*, which often grows so abundantly on the fertile plains in the interior as to give quite a bluish appearance to large tracts of country. With the exception of the "Mitchell grasses," this species is perhaps the most favourably known of all the western indigenous *Gramineae* to stockmen, and they have formed a high opinion of its virtue as a forage plant. It is essentially a summer grass, and usually attains a height of two feet, but occasionally it is taller. In an ordinary season it yields a great amount of herbage, on which all herbivora thrive and fatten readily. If cut when the flower stems first appear it can be made into excellent hay. There is a very fine, robust variety (var. *polystachyus*) of this species found only on rich soils in the warmest portions of the continent, where it often grows five feet high or more. It is popularly called "tassel blue grass," and is excellent feed for horses and cattle. There are 15 indigenous species of *Andropogon*, which occur in many districts from the coast to the back country, and most of them are excellent pasture grasses. The inflorescence of *A.*

bombycinus is copiously covered with silvery white hairs, which give the plant when in flower a remarkable appearance. This grass grows very plentifully in some parts of the interior, and when in bloom gives one, at first sight, the impression that snow has fallen. "Early spring grass" (*Eriochloa punctata*) is another plant with bluish leaves, which give quite a feature to many grazing areas, both east and west of the Dividing Range. This valuable perennial species attains a height of from two to three feet, and generally grows on rich land, where it produces a great amount of nutritious succulent herbage much sought by all herbivora, which thrive and fatten on it.

The "kangaroo grass" (*Anthistiria ciliata*)* is one of the most widely distributed plants on the Australian continent, but is more abundant in the coastal districts than in the interior. On country that is not heavily stocked it sometimes grows six feet high in good seasons, but generally it does not exceed four feet. In the warmer parts it grows more or less all the year round, but south of latitude 32 deg. it is essentially a summer grass, for it seldom makes much growth before October or November, and remains beautifully green during the hot months. Soon after the flowering stems have developed the leaves turn slightly brown when its nutritive qualities are considered at their highest. All herbivora are fond of and do well on the "kangaroo grass," and horses and bullocks when allowed to graze in pastures where it is growing plentifully can be worked very hard, and still keep in good condition—a practical proof of its value for feeding purposes. Analysis has shown that this grass has a high feeding value. Unfortunately it does not mature as much seed as some of its congeners, consequently it is not as plentiful in many places as formerly. Two other perennial and one annual species of this genus occur in many parts of the continent. The last-named *Anthistiria membranacea* (= *Iseilema Mitchellii* Anderss.), popularly called "Barcoo," "Landsborough" and "Red Gulf" grass, generally grows on rich soils, and covers large tracts of country in the north, and in the interior, including Central Australia. Its seeds germinate readily after the spring and early summer rains, and the resulting grass grows throughout the hottest period of the year. It is generally seen growing in small tufts, but in favourable seasons the weak stems lengthen very much, and form an entangled mass of herbage, often two feet deep. The "Barcoo" grass assumes a reddish tint—hence one of its popular names—and thus gives a singular appearance to large areas of country. It is a most nutritious grass, and in autumn often gets so exceedingly dry and brittle that it breaks up into innumerable pieces, but stock are so fond of it that even then they lick the broken stems and leaves from the ground.

Mitchell grass.—*Astrebla triticoides* is one of three species of the same genus bearing the common name of "Mitchell grass." These famous grasses are found on the fertile plains over a great part of the interior, and many pastoralists and stockmen regard them as the best of all the native grasses, both for their drought-enduring qualities and for their fattening properties. All of them

* This is *A. imberbis* (*Themeda Forskali* of Hackel's monograph). *A. ciliata* is an annual.—Ed.

have a branching habit, and under ordinary conditions produce a great amount of nutritious herbage, which is greedily eaten by all herbivora. When these grasses become so dry that the stems and leaves break to pieces, stock may often be seen licking them off the ground, and they seem to do well on this feed, notwithstanding its uninviting appearance. Experienced drovers assert that stock travel farther and keep in better condition when fed on these than on any other grasses in Australia—a practical proof of their high feeding value. *Astrebla triticoides* is the tallest and most vigorous of the Mitchell grasses, and may frequently be seen growing from four to five feet high, and forming large tussocks. Its strong, wiry roots penetrate deeply into the earth, and enable the grass to withstand a phenomenal amount of dry weather. The seeds, when ripe, are like small grains of wheat, and at one time formed an important article of food for the aborigines. There is a variety (var. *lappacea*), of this grass, with ears often more than six inches long, somewhat like big wheat ears, and larger seeds than the species, and they separate easily from the chaff-like grains of wheat. Where wheat would not grow, owing to the great heat, that variety might, after a few years of thorough cultivation and careful selection, be found an excellent substitute, for, according to the best authorities, the wheat plant developed from much less promising material.

The "star" or "windmill" grass (*Chloris truncata*) occurs both east and west of the Dividing Range, and generally on the richest soils. It is abundant on some of the inland plains, and forms a good percentage of many of the pastures in the coastal areas. The "star" grass is very variable as regards its height and the size of its inflorescence. It generally grows from two to three feet high, with the inflorescence 15 inches in diameter; but west of the Darling River there is a form which rarely exceeds a foot, being sometimes only six inches high, with the flower spikes only four inches across. On the country bordering the Macquarie River there is a form which has its flower spikes superimposed in whorls on the stem, and they are singularly attractive. On loose soils the grass tillers well and in many places forms a dense turf. Notwithstanding its variations, it yields a rich, succulent herbage, which is much liked by all herbivora, sheep being particularly fond of it, and fattening on it. There are nine species and several varieties of the genus *Chloris* indigenous to Australia, and they are widely distributed. Most of them are excellent forage grasses, having a high reputation with stockowners, who know them as "blue star grass" and "dog's tooth star grass," as well as by the popular names already mentioned.

Sugar grasses.—*Pollinia fulva** is known to pastoralists as "sugar grass" on account of the sweetness of its young stems and leaves. It sometimes attains a height of four feet, and may be easily recognised, when in flower, amongst other vegetation, by its rich, brown, silky inflorescence; hence it is sometimes called "brown top." This very superior pasture grass is generally found on fertile soils both in the coastal districts and in the interior, but

* *P. fulva* = *P. Cumingii*, var. *fulva* of Hackel's Monograph.

is much more common in the latter. During the summer months, in an ordinary season, it yields a great bulk of sweet nutritious herbage, much relished by all herbivora which fatten on it. Four other species of the genus *Pollinia* occur in the tropical parts of Australia, but none of them is so valuable a pasture grass as the one referred to.

Wallaby.—No other grass in Australia grows under more varied conditions of soil and climate than "wallaby grass" (*Danthonia semiannularis*). It is plentiful on some of the high mountain ranges where snow falls occasionally, and common both in the coastal areas and in the interior. In the coldest districts it grows only six inches high, but under more favourable climatic conditions it attains a height of three feet or more. Although the "wallaby grass" is not particular as to soil and situation, for it may as frequently be seen growing on dry ridges as on the better classes of soils, still it produces a larger quantity of superior herbage on moderately strong, rich, deep land. It is one of the most valuable Australian grasses, and, unlike most of its congeners, grows more or less all the year round. All kinds of stock are remarkably fond of it, sheep particularly so, and thrive on its rich, succulent herbage. There are eleven species and several varieties of the genus *Danthonia* indigenous in Australia most of them widely distributed, and all are excellent forage grasses. The tallest and most remarkable species is *D. robusta* popularly called "ribbon grass," which occurs on the southern mountains, where it forms large tussocks of coarse but nutritious herbage. It usually grows from four to five feet high, but occasionally it is taller and affords shelter for such slender grasses as many species of the genera *Agrostis* and *Deyeuxia*, and other sub-alpine flora.

The grasses mentioned are only a small percentage of the valuable ones indigenous to Australia, but the brief descriptions will suffice to illustrate the great economic value of an important part of the pastoral herbage of this large southern continent.

FRED. TURNER.

V.—THE PRICKLY-FRUITED SPECIES OF EUONYMUS.

T. A. SPRAGUE.

About 100 species of *Euonymus* are known, and of these twelve possess prickly fruits. The latter, however, do not appear to constitute a very natural group, though, for convenience, they may be treated together. Two species have pentamerous flowers and are natives of North America, whilst the remaining ten, which have tetramerous flowers, inhabit eastern and southern Asia. The Asiatic species with prickly fruits might perhaps be regarded as forming a natural group if certain others with scaly fruit, such as *E. vagans*, Wall., are included; but phylogenetic speculation seems premature at the present time. As characters for classification, the length of the petioles, the shape and venation of the leaves, and the prickles of the fruit have been found useful. The practical value of the flowers as a guide to

identification is not very great, owing to the frequent occurrence of polygamy ; many, if not all, of the species of *Euonymus* being polygamo-dioecious or andro-dioecious. According to Darwin,* three forms of flowers are found in *E. europaeus*, Linn., on separate bushes : truly hermaphrodite ; apparently hermaphrodite, but functionally male ; and female. The female flowers can be recognised easily, as they have short stamens bearing rudimentary anthers destitute of pollen, but the functionally male and hermaphrodite flowers are said to be indistinguishable, the pistil and ovules being of the same size and appearance. In *E. subsessilis*, Sprague, and *E. microcarpus*, Sprague, however, two forms of apparently hermaphrodite flowers occur, one of which exhibits greater development of the pistil, and is therefore presumably hermaphrodite, while the other has a less prominent pistil and may be considered as the functional male until experimental proof be forthcoming. No flowers with rudimentary anthers were observed.

It should be noted that the venation of the leaves may alter somewhat during their development ; in *E. echinatus*, for example, the lateral veins are oblique in the young leaves, but become patulous or patent afterwards, and the same appears to hold to some extent in *E. acanthocarpus*. The descriptions of venation here given refer to the mature leaves.

Only three of the prickly-fruited species have come into cultivation as yet, but it seems probable that others may be introduced in the near future. The key and descriptions have therefore been written in English in order to be more generally useful. Technical Latin descriptions are appended of the three proposed new species, and of two additional Chinese ones with spineless fruits.

KEY TO THE SPECIES.

Flowers usually pentamerous ; leaves deciduous :—
  Leaves ovate or lanceolate ... ... 1. *americanus.*
  Leaves obovate ... ... 2. *obovatus.*
Flowers tetramerous ; leaves evergreen :—
  Cymes contracted into dense umbel-like inflorescences ... 3. *contractus.*
  Cymes not contracted :—
    Fruits greyish-green or grey in the dried state :—
      Prickles 2–2·5 mm. long ... ... 4. *cinereus.*
      Prickles 6 mm. long ... ... 11. *angustatus.*
    Fruits tawny, brown, or blackish in the dried state :—
      Leaves elliptic or obovate, obtuse or rounded, not acuminate :—
        Prickles 2 mm. long ... ... 6. *acanthocarpus.*
        Prickles 3–4 mm. long ... ... 5. *Hemsleyanus.*
      Leaves oblong, ovate or lanceolate, acuminate :—
        Prickles 1–3·5 mm. long, not flattened :—
          Young branches densely and minutely tuberculate ; petioles 8–15 mm. long ... ... 6. *acanthocarpus.*
          Young branches not tuberculate ; petioles 1–7 mm. long :—
            Veins very oblique, slightly curved, relatively inconspicuous ; prickles 2·5–3·5 mm. long ... ... 9. *scandens.*
            Veins spreading or oblique, strongly curved, forming a distinct network of arches ; prickles 1–1·5 mm. long :—
              Leaves with 6–9 patent or patulous veins on each side of the midrib ; peduncles very slender ... ... 8. *echinatus.*
              Leaves with 4–7 rather oblique veins on each side of the midrib ; peduncles stout, winged ... 7. *subsessilis.*
        Prickles 5–7 mm. long, flattened or not :—
          Petioles 4–6 mm. long ... ... 10. *actinocarpus.*
          Petioles 1–2 cm. long ... ... 12. *aculeatus.*

* Forms of flowers, pp. 287–293.

1. **E. americanus**, *Linn. Sp. Pl.* (1753), p. 197; *Trelease in A. Gray, Syn. Fl.*, vol. i., p. 396; *Britton & Brown, Ill. Fl.*, vol. ii., p. 394; *Britton, Manual*, p. 605; *Small, Fl. S.E.U.S.*, p. 734.

An erect or ascending shrub, 0·5–2·5 m. high. Leaves ovate or lanceolate, acuminate, 4–8 cm. long, 1–2·8 cm. broad; petioles 1–2 mm. long. Peduncle 1–2 cm. long, very slender. Cymes 1–3-flowered. Corolla 8–12 mm. across, greenish-purple. Capsule 3–5-lobed, 1·5–2 cm. across, red; prickles about 1 mm. long. Aril scarlet.

NORTH AMERICA. In low woods and on river banks, from New York to Florida, Nebraska and Texas.

2. **E. obovatus**, *Nutt. Gen.*, vol. i. (1818), p. 155; *Trelease, l.c.* 397; *Britton & Brown, l.c.; Britton, l.c.; Small, l.c.*

A low decumbent shrub, seldom rising more than 0·3 m. from the ground, with trailing branches, rooting at the nodes. Leaves obovate, usually obtuse, 2·5–5 cm. long, 1·25–3·5 cm. broad; petioles 2–4 mm. long. Peduncle 1–3 cm. long, very slender. Cymes 1–3-flowered. Corolla 6–8 mm. across, greenish-purple. Capsule 3-lobed, 1·5–2 cm. across, crimson. Aril scarlet.

NORTH AMERICA. In low woods and on river banks, from Ontario and Pennsylvania to Illinois and Tennessee.

3. **E. contractus**, *Sprague*, n. sp.

A bush, 0·6 m. high. Leaves elliptic-oblong, obtuse, 2·5–4 cm. long, 1·5–2 cm. broad, coriaceous; lateral veins patulous, very inconspicuous in the dried state; petioles 3–5 mm. long. Peduncle 4–10 mm. long. Cymes twice to four times forked, contracted into dense umbel-like inflorescences. Corolla 7–8 mm. across, white. Capsule not known.

WESTERN CHINA. On cliffs, 1050 m., *Wilson*, 3327.

4. **E. cinereus**, *Laws. in Hook. f. Fl. Brit. Ind.*, vol. i., p. 611 (1875).

A scandent shrub, with densely tubercled branches. Leaves obovate, rounded, obtuse or very shortly acuminate, 4–7 cm. long, 2–4 cm. broad; lateral veins oblique, easily seen in the dried state; petioles 5–9 mm. long. Peduncle 1–1·5 cm. long in fruit. Flowers not known. Capsule depressed, greyish-green, about 1·3 cm. across, including the prickles; prickles 2–2·5 mm. long.

ASSAM. Mishmi Mountains, Lai Pani, *Griffith*, 1975.

5. **E. Hemsleyanus**, *Loes. in Engl. Jahrb.*, vol. xxx., p. 460 (1902).

A shrub, rather over 1 m. high. Leaves obovate, elliptic or elliptic-oblong, rounded, obtuse or very shortly acuminate, 2·5–6 cm. long, 1·5–3 cm. broad; lateral veins oblique, easily seen in the dried state; petioles 3–7 mm. long. Peduncle 5–7 mm. long, up to 1·5 cm. long in fruit. Cymes once or twice forked. Corolla about 7 mm. across, green. Capsule pale brown in the dried state, rather over 1 cm. across, including the prickles; prickles 3–4 mm. long.

YUNNAN. Mengtze, 1350 m., *Henry*, 9120 ; in crevices of rocks on mountain flanks in the Mengtze plain, *Hancock*, 492.

6. **E. acanthocarpus**, *Franch. Pl. Delav.* (1889), p. 129 ; *Loes. in Engl. Jahrb.*, vol. xxx., p. 459.

A shrub, 3–4 m. high, with densely tubercled branches. Leaves lanceolate or oblanceolate, more rarely ovate or obovate, shortly acuminate, 5–12 cm. long, 1·5–5 cm. broad ; lateral veins rather oblique, easily seen on the upper surface in the dried state, and more or less inconspicuous on the lower ; petioles 8–20 mm. long. Peduncle 1–6 cm. long. Cymes twice to five times forked Corolla about 7 mm. across, greenish-yellow. Capsule about 1 cm. across, including the prickles ; prickles 2 mm. long.

YUNNAN. On Mt. Che-tcho-tze, above Tapintze, *Delavay*, 2816 ; Mengtze, N. Mts. 2100 m., *Henry*, 10544 B, 10304.

SZECHUAN. Mt. Omi, *Wilson*, 3330 A, 4784 A.

HUPEH. Fang, *Wilson*, 1280 ; Paokang, *Wilson*, 2150, 2150 A ; Patung district, *Henry*, 3706 ; Nanto, *Henry*, 2991.

7. **E. subsessilis**, *Sprague*, n. sp.

A shrub, 2–2·5 m. high. Leaves elliptic-oblong, lanceolate or ovate, acuminate, 4–9 cm. long, 1·5–4 cm. broad ; lateral veins rather oblique, anastomosing at a considerable distance from the margin to form a loose network which is very evident, especially on the lower surface ; petioles 1–2 mm. long. Peduncle 1–3 cm. long, conspicuously winged. Cymes twice or three times forked. Corolla 7–8 mm. across. Capsule brown in the dried state, hardly 1 cm. across, including the prickles ; prickles 1–1·5 mm. long.—*E. echinatus*, Loes. in Engl. Jahrb., vol. xxx., p. 459, non Wall.

HUPEH. Neighbourhood of Ichang, *Henry*, 3116, 3511, 3511 A, 3511 B.

SZECHUAN. Mt. Omi, 1050 m., *Faber*, 198 ; Mt. Omi, *Wilson*, 4784, 4785.

8. **E. echinatus**, *Wall. in Roxb. Fl. Ind. ed. Carey*, vol. ii. (1824), p. 410 ; *Laws. in Hook. f. Fl. Brit. Ind.*, vol. i., p. 611, partly ; *Duthie, Cat. Pl. Kumaon*, p. 32.

A scandent shrub. Leaves elliptic-oblong or lanceolate, less frequently ovate, acuminate, 3·5–8 cm. long, 1·5–3 cm. broad ; lateral veins patent or patulous, anastomosing to form a rather close network which is usually more evident on the upper surface ; petioles 3–7 mm. long. Peduncles very slender, 1–2 cm. long. Cymes once or twice forked. Corolla 7–8 mm. across, green. Capsule under 1 cm. across, including the prickles ; prickles 1–1·5 mm. long.

SIKKIM. *Hooker.*

NEPAL. *Wallich.*

KUMAON. Binsur Peak, about 2,200 m., *Strachey & Winterbottom.*

GARHWAL. *Herb. Falconer*, 361.

KASHMIR. Jamu hills, *Thomson.*

Distinguished from the following by the venation of the leaves and the shorter prickles. Both species are represented on the single sheet of *Wallich*, 4285, in the Linnean Society's Herbarium; but Wallich's description leaves no doubt as to which he had in mind.

9. **E. scandens**, *R. Graham in Edinb. N. Phil. Journ.*, Jan.–Mar. 1827, p. 386.

A tall scandent shrub. Leaves ovate, ovate-lanceolate or elliptic, acutely acuminate, 4–8 cm. long, 1·8–3·5 cm. broad; lateral veins oblique, not forming a distinct network; petioles 3–7 mm. long. Peduncles slender, 1–2 cm. long. Cymes twice or three times forked. Corolla 5 mm. across, yellowish-white. Capsule over 1 cm. across, including the prickles; prickles 2·5–3·5 mm. long.—*E. echinatus*, Hook. in Bot. Mag. t. 2767; Laws. in Hook. f. Fl. Brit. Ind., vol. i., p. 611, *partly*, not of Wallich.

NEPAL. *Wallich.*

10. **E. actinocarpus**, *Loes. in Engl. Jahrb.*, vol. xxx., p. 459 (1902).

Leaves ovate or elliptic-oblong, acuminate to the apex, obtuse or rounded at the base, 6–9 cm. long, 2–4 cm. broad, pale green, almost glaucous on the lower surface; lateral veins rather oblique, the more prominent ones about five a side, easily seen on the upper surface in the dried state, rather inconspicuous on the lower; petioles 4–6 mm. long. Peduncles distinctly winged, 2·5–3 cm. long in fruit. Cymes three or four times forked. Flowers not known. Capsule about 1·7 cm. across, including the prickles, pale brown in the dried state; prickles 5 mm. long.

HUPEH. Nanto, *Henry*, 4399 (quoted by mistake as 4339 in the original description).

11. **E. angustatus**, *Sprague*, n. sp.

Leaves rhomboid-elliptic, acuminate to the apex, conspicuously cuneate at the base, 5–9 cm. long, 2–4 cm. broad, shining above, dull below; lateral veins oblique, about six a side, conspicuous on the upper surface in the dried state, inconspicuous on the lower; petioles 7–12 mm. long. Peduncles narrowly winged, 3–4 cm. long in fruit. Cymes four or five times forked. Flowers not known. Capsule over 2 cm. across, including the prickles; prickles 7 mm. long, very flattened towards the base.—*E. echinatus*, Hemsl. in Journ. Linn. Soc. Bot., vol. xxiii., p. 119, *partly*, not of Wallich.

KOWLOON. Near Tai-mo-shan, *Herb. Hongk.*, 639.

CHINA. Without locality or collector's name *Herb. Hook.*

Wright, 32, from the Liukiu Islands, quoted by Hemsley l.c., may belong to *E. angustatus* or to an undescribed species allied thereto. The Liukiu specimen is in flower only, and *E. angustatus* is known in fruit only; hence a satisfactory comparison cannot be made.

12. **E. aculeatus**, *Hemsl. in Kew Bull.* 1893, p. 209; *Loes. in Engl. Jahrb.* vol. xxx., p. 459.

A large scandent shrub. Leaves elliptic-oblong, obovate-oblong or lanceolate, acuminate to the apex, more or less cuneate at the base, 6–17 cm. long, 2–6 cm. broad, coriaceous; lateral veins oblique, five to seven on each side of the midrib, more or less inconspicuous on both surfaces; petioles 1–2 cm. long. Peduncle winged, 1·5–5 cm. long. Cymes three to five times forked. Corolla 8–10 mm. across. Capsule immature, 1·3 cm. across, including the prickles; longest prickles about 5 mm. long, tawny, very flattened.

HUPEH. South Patung, *Henry*, 6143; W. Hupeh, *Wilson*, 1284.

SZECHUAN. South Wushan, *Henry*, 5335 A.

YUNNAN. Mengtze; S.E. mountains, 1500 m., *Henry*, 10733.

NOVARUM SPECIERUM DESCRIPTIONES.

Euonymus contractus, *Sprague*; affinis *E. Hemsleyano*, Loes., a quo venatione foliorum et inflorescentiis contractis subglobosis recedit.

Frutex 0·6 m. altus. *Folia* elliptico-oblonga, obtusa, 2·5–4 cm. longa, 1·5–2 cm. lata, coriacea, venis lateralibus patulis exsiccando fere occultis; petioli 3–5 mm. longi. *Pedunculi* 4–10 mm. longi. *Dichasia* bis usque quater furcata, contracta, umbelliformia, pedunculis secundariis et tertiariis brevissimis; pedicelli 2·5–4 mm. longi. *Flores* 8 mm. diametro. *Sepala* semielliptica, exteriora 0·75 mm. longa, 1·5 mm. lata (ab exteriore visa), interiora 1 mm. longa, 2–2·5 mm. lata. *Petala* alba, orbicularia, 3·5 mm. diametro, carnosa, tandem valde convexa. *Discus* quadratus, 2–2·5 mm. diametro. *Filamenta* subulata, 2·5–3 mm. longa; antherae vix ultra 1 mm. diametro. *Ovarium* verrucosum, ovulis 2 pro loculo collateralibus pendulis; stylus quadrangularis, circiter 1 mm. longus, demum 1·5 mm. longus. *Capsula* ignota.

WESTERN CHINA. On cliffs, 1050 m., *Wilson*, 3327.

Euonymus subsessilis, *Sprague*; affinis *E. acanthocarpo*, Franch. et *E. echinato*, Wall.; a priore foliis subsessilibus, a posteriore venatione laxiore, pedunculis crassioribus alatis recedit.

Frutex 2–2·5 m. altus. *Folia* elliptico-oblonga, lanceolata vel ovata, acuminata, 4–9 cm. longa, 1·5–4 cm. lata, venis lateralibus satis obliquis, satis procul a margine anastomosantibus, exsiccando conspicuis praesertim subtus; petioli 1–2 mm. longi. *Pedunculi* conspicue alati, 1–3 cm. longi. *Dichasia* bis vel ter furcata; pedicelli 3·5–4 mm. longi, iis florum hermaphroditorum verruculosi. *Flores* 7–8 mm. diametro. *Sepala* hyalino-marginata, in floribus hermaphroditis distincte ciliolata. *Petala* suborbicularia, 3–3·5 mm. diametro, margine inflexo. *Discus* 2·5 mm. diametro in floribus masculis, 2 mm. in floribus hermaphroditis. *Filamenta* subulata, 1·5–1·75 mm. longa. *Ovarium* in floribus hermaphroditis prominens, distincte 4-lobum, verruculosum, in floribus masculis paullo ab disco elevatum, papillosum; stylus circiter 1 mm. longus; ovula 2 pro loculo, collateralia pendula. *Capsula* exsiccando brunnea, vix usque ad 1 cm. diametro, aculeis inclusis; aculei 1–1·5 mm. longi. *Semina* vix 5 mm. longa, in arillo omnino inclusa.—*E. echinata*, Loes. in Engl. Jahrb. vol xxx., p. 559, non Wall.

HUPEH. Neighbourhood of Ichang, *Henry*, 3116, 3511, 3511A, 3511B.

SZECHUAN. Mt. Omi, 1050 m., *Faber*, 198; Mt. Omi, *Wilson*, 4785, 4784.

Euonymus angustatus, *Sprague*; affinis *E. actinocarpo*, Loes., et *E. aculeato*, Hemsl.; a priore forma foliorum, a posteriore aculeis fructus multo crassioribus recedit.

Frutex, ut videtur. *Folia* rhomboideo-elliptica, acuminata, basi conspicue cuneata, 5–9 cm. longa, 2–4 cm. lata, supra nitida, subtus opaca; venae laterales obliquae, utrinque circiter 6, supra conspicuae, subtus inconspicuae; petioli 7–12 mm. longi. *Pedunculi* anguste alati, sub fructu 3–4 cm. longi. *Dichasia* quater vel quinquies furcata. *Flores* ignoti. *Capsula* ultra 2 cm. diametro, aculeis inclusis; aculei circiter 44, 7 mm. longi, versus basin valde complanati. *Semina* 7–8 mm. longa, arillo omnino inclusa. —*E. echinatus*, Hemsl. in Journ. Linn. Soc. Bot. vol. xxiii., p. 119, partim, non Wall.

CHINA. Kowloon, near Tai-mo-shan, *Herb. Hongk.*, 639; China, without locality or collector, *Herb. Hook.*

Euonymus microcarpus, *Sprague*; ab *E. chinensi*, Lindl. foliis peracutis sensim acuminatis, capsulis brevioribus depressis, antheris florum masculorum haud sessilibus recedit.

Arbor 6 m. alta. *Folia* elliptica vel ovata, peracute sensim acuminata, basi cuneata, tenuiter coriacea vel chartacea, 5–8 cm. longa, 2·5–4 cm. lata, venis lateralibus obliquis approximatis leviter curvatis tantum, reticulatione haud conspicua; petioli 0·7–2 cm. longi. *Pedunculi* 1·5–3 cm. longi. *Dichasia* bis usque quarter furcata; pedicelli 1·5–5 mm. longi. *Flores* ut videtur androdioici. ♂ 9 mm. diametro. *Sepala* brunneo-ciliolata. *Petala* suborbicularia circiter 3 mm. diametro, ciliolata, patentia, demum deflexa, marginibus lateralibus reflexis. *Filamenta* 1·5 mm. longa. *Antherae* reniformes, apiculatae, 0·8 mm. latae. *Stylus* circiter 0·75 mm. longus. *Ovula* 2 pro loculo, collateralia, descendentia. ♂ (functione) 5 mm. diamerto. *Petala* 2 mm. diametro. *Filamenta* 0·5–0·75 mm. longa. *Stylus* vix 0·3 mm. longus. *Capsula* depressa, circiter 1 cm. diametro, 5 mm. longa, immatura profunde lobata. *Semina* in arillo omnino inclusa, vix 5 mm. longa.—*E. chinensis* var. *microcarpus*, Oliv. ex Loes. in Engl. Jahrb. vol. xxx., p. 456.

HUPEH. Nanto, *Henry*, 3073; Ichang, *Henry*, 1397 (masc.), 1650 (fruct.), 3099 (fruct.), 3580 (masc.).

WESTERN CHINA. Without precise locality, *Wilson*, 3332.

Euonymus mengtseanus, *Sprague*; affinis *E. Griffithii*, Kurz., et *E. theifolio*, Wall.; a priore foliis petiolatis, a posteriore ramulis alatis haud tuberculatis, a speciebus ambabus floribus majoribus recedit.

Arbuscula 3 m. alta, ramulis quadrialatis. *Folia* obovato-elliptica vel elliptica, basi obtusa, apice obtuse acuminata, acumine 7–10 mm. longo, 6–9 cm. longa, 2·5–4 cm. lata, tenuiter coriacea, venis lateralibus patulis in rete distinctum satis remote ab margine

anastomosantibus supra insculptis subtus prominentibus ; petioli 7–10 mm. longi. *Pedunculi* 1·5–2 cm. longi. *Dichasia* semel vel bis furcata ; pedicelli 5–8 mm. longi. *Flores* 10–13 mm. diametro. *Sepala* glanduloso-ciliolata. *Petala* suborbicularia circiter 4·5 mm. diametro. *Discus* 4 mm. diametro. *Antherae* sessiles, 1 mm. latae. *Ovula* 2 pro loculo, collateralia, pendula. —*E. theifolius* var. *mengtseanus*, Loes. in Engl. Jahrb. vol. xxx., p. 455.

YUNNAN. Mengtze, S.E. mountain forests, 1500 m., *Henry*, 10684.

Closely allied both to *E. Griffithii* and *E. theifolius*, and evidently nearer the former. *E. Griffithii* and *E. mengtseanus* have smooth, 4-winged branchlets, whereas *E. theifolius* has tubercled, 6–8-ribbed branchlets.

VI.—YEHEB.

(*Cordeauxia edulis*, Hemsl.)

History.—The existence of this interesting Somaliland plant appears to have been first recorded in June, 1895, by the late Capt. M. S. Wellby, 18th Hussars, whose death was announced in the *Kew Bulletin* for 1901, p. 171. Wellby refers to it, as 'Yee-ep,' in several passages in his *Report of a Journey in Somaliland in* 1895.

After an interval of ten years, a sample of its seeds, under the name "'Yebb' nuts," was forwarded to the Imperial Institute in June, 1905, by Col. E. J. E. Swayne, C.B., at that time H.M.'s Commissioner, Somaliland Protectorate, with the object of having their nutritive value determined. A subsequent consignment reached the Imperial Institute at a later date, from the same source. A quantity of seeds from this later consignment was sent on March 30, 1906, to Professor A. H. Church, F.R.S., who brought some of these seeds to the Herbarium at Kew for identification. From the material supplied, identification was impossible, but a few of the seeds were sown, and two small plants were obtained.

On April 23, 1906, another small supply of 'Yebb' nuts was sent direct to Kew from the Imperial Institute ; it was of course impossible to identify the 'nuts,' and none of them germinated. At the same time it was stated that they came from Somaliland, so that it was possible to try to secure herbarium specimens.

This proved to be a somewhat difficult matter, but at length, through the sustained efforts of Capt. H. E. S. Cordeaux, C.B., H.M.'s Commissioner, Somaliland Protectorate, specimens were obtained, which reached Kew on July 29, 1907, and showed conclusively that 'Yeheb' or 'Yehib'—for Capt. Cordeaux uses both forms—is a Leguminous plant belonging to a previously unknown genus of the *Caesalpinieae*, most nearly allied to, but very distinct from, the genus *Schotia* in the tribe *Amherstieae*.

This information was at once communicated to the Imperial Institute and the necessary diagnoses were drawn up. These

appeared in the *Kew Bulletin* for 1907, No. 9, p. 361, issued in October last ; the plant has since been figured in *Hooker's Icones Plantarum*, vol. xxix., tt. 2838, 2839.

The names of three British officers must always remain associated with the history of 'Yeheb' ; that of Capt. Wellby as having first recorded the existence, appearance, and properties of the plant, and as having supplied precise records of its occurrence ; that of Col. Swayne as having first recognised the possible importance of its seeds as a food-stuff and appreciated how necessary it was to obtain scientific evidence as to their chemical composition and nutrient value ; that of Capt. Cordeaux as having been the first to procure, with much pains, the herbarium material required for the botanical determination of the species.

Material for Study.—If the history of our knowledge of 'Yeheb' be simple, the task of unravelling it has been less easy. The first intimation of the existence of 'Yeheb' to reach Kew was the reference here, in the beginning of April, 1906, by Professor Church, of some seeds, termed 'Yebb' nuts, with the information that they were of an interesting chemical composition, but with no clue to their origin. A memorandum accompanying a consignment of seeds of the same species, sent to Kew by the Imperial Institute on April 23, 1906, described them as "'Yebb' nuts from Somaliland," but said nothing as to their properties. There was nothing to indicate, and owing to the interval between their receipt it did not happen to suggest itself, that there might be a connection between these two sets of seeds.

No trace of the name 'Yebb' could be found in the literature or the correspondence at Kew, but the clue to their origin supplied by this memorandum led to communication with correspondents who had travelled in Somaliland or were interested in its vegetation. The result was not encouraging, since those consulted appeared unacquainted either with the name or with the plant.

Fortunately, on June 27, 1906, the Rev. Dr. Warre, while visiting Kew, learned our difficulty, and although unable himself to afford direct assistance, kindly volunteered to try to help indirectly. His aid was prompt and effective. On July 6, 1906, Dr. Warre wrote :—"I enclose a letter which I have received "from Capt. Troyte, of the K.R.R., who was all through the "Somaliland business. I am afraid that it does not throw much "light on the subject of the nut, but it at least indicates the "quarter from which information may be obtained, viz., Major "Cordeaux, the Consul-General at Berbera." A letter asking for information and help was despatched to Capt. Cordeaux.

Before a reply could be received from Berbera, Professor Dunstan, F.R.S., wrote to Kew, under date July 18, 1906 :— "Last April I sent to you a specimen of Yebb nuts from Somali- "land for identification. Mr. Hemsley, in his letter of 27th April, "stated that it had not been possible to identify the nuts, but that "as they apparently retained their germinative power it was hoped "to determine their botanical origin later. I shall be glad if you "will let me know whether it was possible to raise any plants "from the seeds, and if so, whether you have any clue to the

"botanical source of the 'nuts.'" On July 19 Kew replied that 'Yebb' still remained a mystery; that no plants had come up from the seeds sent on April 23, but that two small plants had been raised from some seeds previously received at Kew. The letter further stated that Kew assumed that these earlier seeds also came originally from Somaliland although Somaliland correspondents who had replied to our enquiries appeared not to have heard of 'Yebb,' and added that Kew had been put in touch by Dr. Warre with a correspondent in Somaliland, so that definite information was still hoped for.

To the letter begging for his help in the matter Capt. Cordeaux replied as follows, in a letter received on August 17 :—

"Camp Arioleh, Berbera, July 28th, 1906.

"I write to acknowledge the receipt of your letter of the "6th instant asking for further information about the Yebb nut.

"There is no doubt that these nuts really do come from "Somaliland, though I believe they are not to be found actually "within the British Protectorate limits.

"The Yebb or Yeheb (which spelling more correctly "represents the native pronunciation) is a small bush which "grows in great quantities in the 'Haud' or waterless desert south "of Bohotleh and of the southern frontier of the Protectorate. "I have never myself seen the bush which is described by "Wellby in his *Reports on Journeys in Somaliland* as 'a small "'thick-leaved bush, always green, with a nut enclosed in a thin "'crisp shell and eaten stewed. If the green leaves are rubbed "'in the hands, they are stained red.'

"The nuts, which according to Professor Dunstan's recent "analysis, evidently possess great nutrient value, form the staple "article of food of the poorer classes of natives living in the "'Haud,' and are for the most part consumed as they are collected. "Small quantities of the nuts, however, find their way amongst "the northern tribes and even as far as the coast towns, where "they are eagerly bought by the Somalis, who have great faith in "their nutrient and medicinal properties, often preferring them to "their usual dietary of rice and dates. The bush is said to seed "itself readily and to grow with great rapidity.

"I will endeavour to obtain the herbarium specimens you "require, but fear this may take some time, owing to the distance "(some 150 miles) of the Yeheb country from our most "advanced post. It is also difficult to get natives to bring in "good specimens at the first attempt, many of them being spoilt "and damaged on the journey before they can be properly pre-"pared. I hope, however, to be able to obtain some sufficiently "good specimens to enable you to identify this interesting plant, "and will despatch them as soon as possible to your address at "Kew."

The information regarding Yeheb contained in this letter was the first to reach Kew; in addition to its intrinsic value it enabled us to obtain the *Report* by Capt. Wellby, the existence of which had been unknown to us. The importance of Wellby's information, which will be considered below, lies in the fact that 'Yeheb' was known to him at first hand.

The next letter from Capt. Cordeaux is as follows :—

"Berbera, January 2, 1907.

"I much regret that I have as yet been unsuccessful in obtaining the herbarium specimens of the Yehib tree which you asked for. The specimens which the natives I have sent out have brought in have not been worth sending you. I recently sent a more intelligent man for the purpose and I hope that he will be more successful.

"In the meantime it may interest you to know that I have succeeded in rearing four small plants in my garden at Berbera from the nuts, despite the asseverations of the Somalis that the tree would not grow anywhere except in the 'Haud.'

"If these young plants continue to do well, and failing other specimens, I will send you specimens taken from them."

This letter was followed shortly afterwards by another :—

"Berbera, January 30, 1907.

"I am sending you to-day a specimen of a small Yehib bush which has just been brought in to me. I fear that it is not a very good specimen as it has suffered considerably from the long journey down to the coast. The Somali who brought it declares that it was in blossom when he dug it up but unfortunately they [the flowers] have all dried up and fallen off, as has happened to most of the leaves. I hope however that the specimen may be of some use. The Somalis say that the bush has very deep roots and that even in the case of this small bush the roots were about six feet long. The black core which you will notice running down the centre of the main root is curious. It is also to be observed that if the leaves are slightly moistened and rubbed between the fingers a magenta-coloured stain is produced.

"The young plants which I have grown here from seeds are fairly healthy but are making very slow progress. They have been doing better since I have stopped watering them."

The bush referred to in this letter reached Kew on February 26, 1907. It is somewhat over two feet in height from above ground, densely virgate and in shape reminds one of a birch broom. The black core of the stout root recalls the heartwood of *Dalbergia Melanoxylon*, Guill. & Perrotet. This bush is now exhibited in Kew Museum No. I., Case 42, and a reduced figure of it is given in *Hooker's Icones Plantarum*, vol. xxix., t. 2838. Though of interest as conveying an accurate impression of the habit of 'Yeheb' it does not, in itself, suffice to throw light on the botanical identity of the plant. Consequently to a reminder from the Imperial Institute, dated March 6, 1907, it was necessary to reply that the identification of 'Yebb' nuts was still impossible, and in the interesting article on the subject published in the *Bulletin of the Imperial Institute*, vol. v., p. 19—the analytical part of which we are able, through the courtesy of Professor Dunstan, to reproduce below—it was stated that "it has not been possible to ascertain the botanical origin of the nuts." The analysis in question, it will be observed, though not published till 1907, is referred to in the letter of July 28, 1906, addressed to Kew by Capt. Cordeaux. This circumstance led Kew inadvertently

to conclude that Capt. Cordeaux was the Commissioner of the Somaliland Protectorate mentioned in the Imperial Institute *Bulletin* as having sent the seeds there.

In a letter to Kew dated June 19, 1907, Dr. Warre showed his continued interest in the subject by sending some 'Yeheb' beans from Somaliland. These beans proved to be identical with the seeds received in April, 1906, but none of them germinated.

Capt. Cordeaux at last succeeded in procuring specimens, and on July 26, 1907, the following letter from him reached Kew :—

"Berbera, *via* Aden, July 8, 1907.

"I have made several attempts to obtain specimens of the "flowers of the Yeheb bush, but I fear without much success. "The last specimens I received arrived crushed almost out of all "recognition, and as they had evidently been picked during, or "immediately after, rain, they were nearly all mouldy and "rotten.

"One small sprig, however, seemed worth keeping, and this I "endeavoured to press and now enclose. I am afraid it cannot be "regarded as a botanical specimen, but it may help to identify the "genus of the bush.

"I am also sending by parcel post a few of the less damaged "specimens that arrived at the same time, together with some "Yeheb nuts in the pod, which you may not have seen.

"I trust you may be able to discover something of interest from "these rather meagre specimens, and I shall be very interested to "hear the result. The word Yeheb I should say is a purely "Somali word, and as far as I have been able to ascertain has no "particular meaning, and is merely the native (Somali) name for "the plant."

From the material thus supplied by Capt. Cordeaux it was possible, in spite of the fact that the expanded flowers were all more or less damaged by insects, to draw up a complete description of the plant; an uninjured flower-bud afforded the information necessary as regards the number and relative position of the parts, while the injured flowers supplied material for the remaining figures in *Hooker's Icones Plantarum*, tt. 2838, 2839.

On July 31st, 1907, the identification of the 'Yeheb' plant was sent to the Imperial Institute.

On August 1st Dr. Warre sent seeds from a fresh consignment of 'Yeheb' nuts from his friend in Somaliland, coming from a different quarter from those sent before. From these seeds a considerable number of healthy young plants came up; these plants have grown more rapidly and look much stronger than the two first raised.

The Imperial Institute memorandum of April 23, 1906, and the article in the Imperial Institute *Bulletin*, No. 1 of 1907, give no precise locality in Somaliland for the 'Yeheb' seeds sent for identification. In the hope of obtaining more definite information on this point, a letter was addressed to the Institute on August, 7, 1907. The reply, dated August 8th, stated that :—

"The only information which we have regarding the geographical "origin of the seeds submitted to you is the following statement

"by the Commissioner of the Somaliland Protectorate in for-
"warding the sample :—'The nut grows wild in the Haud
"'waterless wilderness, south of Bohotleh, and is much sought
"'after as food by the Dolbahanta Somalis.'"

This letter adds nothing material to the information which Kew had already obtained, and, the 'Haud' being an extensive area, still leaves the precise locality of the material on which the botanical description of 'Yeheb' is based somewhat doubtful. But the similarity of the statement quoted above with that contained in the letter, dated July 28, 1906, from Capt. Cordeaux, only strengthened the impression—now known to be erroneous—that Capt. Cordeaux was the Commissioner of the Somaliland Protectorate who had sent the samples of 'Yebb' nuts in the first instance to Professor Dunstan. From the information actually available it was necessary to say that the material from which the descriptions published in the *Kew Bulletin* were drawn up consisted of :—"Seeds from Prof. A. H. Church, F.R.S., and Prof. W. R.
"Dunstan, F.R.S. An entire plant, detached flowers and pods,
"from Captain H. E. S. Cordeaux, C.B., H.M.'s Commissioner."

In a letter to Kew, dated October 22, 1907, Professor Dunstan has pointed out that this statement with regard to the sources of the material is somewhat misleading, owing to the fact that the seeds given to Kew by Professor Church were handed to Professor Church by himself for an opinion as to their nutrient value ; and to the further fact that the sample from which these seeds were selected had been sent to the Imperial Institute in the first instance by Col. Swayne, when the latter was H.M.'s Commissioner in Somaliland. In a subsequent letter, dated November 12, 1907, Professor Dunstan has added that the seeds corresponding to those sent by him to Kew on April 23, 1906, were sent to Professor Church on March 30, 1906. Professor Dunstan explains that the credit for bringing 'Yebb' nuts to light is entirely due to Col. Swayne, who realised their probable importance as a food stuff in 1905, and since then has interested himself greatly in the subject.

The misleading nature of the reference was unavoidable, since Kew had no means of ascertaining these facts until Professor Dunstan supplied them. His communication was, however, opportune, and it was possible to include it in the account of 'Yeheb' that accompanies the figures published in *Hooker's Icones Plantarum*, vol. xxix., tt. 2838, 2839.

Properties and Uses.—Captain Wellby (*Report on a Journey in Somaliland in* 1895 ; *Appendix* ii., *Vegetation*, p. v.) describes 'Yeheb' briefly as follows :—"99. Yee-ep ; Hawea.—Small thick-
"leaved bush, always green ; after the rains the fruit is collected.
"Kind of nut enclosed in a thin crisp shell. Should be eaten
"stewed. If the green leaves are rubbed in the hands, they are
"stained red." The bush sent to Kew by Capt. Cordeaux, which is about two feet high, is spoken of by him as a small example, but as Capt. Cordeaux has not himself seen the plant growing wild and as Capt. Wellby has not definitely indicated its size we are unable to state even approximately its maximum height. That it it has a remarkably deep tap-root is clear, and as Capt. Cordeaux

in one passage refers to 'Yeheb' as a "tree" it is probable that at times it is of considerable size. Whatever its extreme limits may be we know that 'Yeheb' has a densely virgate habit and a hard wood that ultimately becomes ebonised at the core. The compound evenly pinnate exstipulate leaves are from 1–2 in. long; the leaflets are usually 4-paired, leathery, oval-oblong, from $\frac{1}{2}$–1 in. long, and densely beset beneath with reddish flat glands; if the leaves be soaked in water the fluid takes up from these glands a reddish dye, while as Capt. Wellby and Capt. Cordeaux state if the leaves be rubbed in the hand, these glands stain the skin reddish or magenta. The flowers, which are not numerous, are arranged in small corymbs, very little longer than the leaves, at the ends of the branches. The sepals, which are oblong-obtuse, are about $\frac{1}{3}$ in. long, and are glandular like the leaves. The petals are spathulate and clawed, rather over $\frac{1}{2}$ in. long. The stamens, ten in number, are free and bearded below. The ovary, shortly stipitate, is glandular like the sepals and leaves. The fruit is a crisp, leathery, compressed-ovoid, 2-valved pod, beaked at the tip and from $1\frac{1}{2}$–$2\frac{1}{2}$ in. long. The seeds, popularly but erroneously spoken of as "'Yeheb' nuts," are from $1\frac{1}{4}$–2 in. long; they have no albumen but have thick fleshy cotyledons and are used as an article of food. For an account of the structure and nature of the peculiar dye-yielding glands on the leaves, sepals and pistil, reference may be made to an interesting note, with a figure in the text, by Mr. L. A. Boodle in *Hooker's Icones Plantarum*, vol. xxix., under tt. 2838, 2839.

The behaviour of young 'Yeheb' plants under cultivation is dealt with in the following memorandum by Mr. W. Watson, Curator, Kew:—"Plants of 'Yeheb' have been raised at Kew "from seeds received, first from Professor Church in April, 1906, "and secondly from Dr. Warre in August, 1907. The seeds were "sown in tropical moist conditions and germinated readily, the "second lot being stronger than the first, probably because the "seeds were fresher. Kew has now 25 healthy young plants, "the strongest being six inches high with dark-green evenly "pinnate somewhat leathery leaves. In every case the first pair "of leaves are opposite, but subsequent leaves in some of the "plants are arranged alternately on the stem. So far the plants "appear to enjoy the moist heat of a tropical stove; this, however, "is quite usual with seedlings of dry-country plants which after-"wards show a preference for drier conditions. Judging from "present appearances it is probable that 'Yeheb' will not be "difficult to cultivate in tropical countries."

Writing on August 17th, 1907, with regard to the 'Yeheb' seeds referred to in his letter of August 1st, Dr. Warre says:—"The "day before yesterday three of my 'Yeheb' nuts germinated and "are now about an inch above ground. These are from the new "batch. Those sown from the old batch have made no sign. The "little plants differ from anything I have seen before and are "very interesting; little dirty-white fleshy stems, covered over "with small red specks." In later letters Dr. Warre speaks of these young plants as flourishing and growing fast, but more recently their growth has been slower and less satisfactory, and they have shown a tendency to drop some of their leaves. As we have seen,

even at Berbera, the young plants raised by Capt. Cordeaux after a time called for a change in treatment. Capt. Cordeaux quotes his native informants as stating that in its natural habitat 'Yeheb' grows with great rapidity.

Col. Swayne states that the seeds of 'Yeheb' are much sought after as food by the Dolbahanta Somalis. Capt. Cordeaux describes them as being the staple food of the poorer inhabitants of the 'Haud' to the south of Dolbahanta, and adds that besides using the seeds as food, often in preference to their ordinary diet of rice and dates, the Somalis ascribe to them medicinal properties. He tells us also that though the seeds are mostly consumed locally, some of them find their way to and are readily bought by the Somalis of the coast towns. As to this Capt. Wellby too has explained that Mudug, a small district which serves as a buffer between the Dolbahanta, Midjourten and Marehan territories, is regularly visited by khafilas of merchants both from Berbera on the north and Obbia on the east coasts. These merchants bring cloth and dates which they exchange for gums, sheep, ghi, feathers and Yee-ep, "a fruit peculiar to these parts." Capt. Wellby does not, however, state that 'Yeheb' is a native of Mudug.

In the *Bulletin of the Imperial Institute*, vol. v., p. 19, we are informed that 'Yeheb' nuts have formed the principal food of the Somalis during the famines induced by the severe droughts which have prevailed in Somaliland during recent years.

The analysis of kernels selected from the second consignment sent to the Imperial Institute, which Professor Dunstan has permitted us to reproduce, gave the following results :—

	Per cent.
"Moisture	9·3
Ash	3·1
Sugars { Reducing	2·3
Sugars { Cane	21·6
Carbohydrates (other than sugars), by difference...	37·1
Proteids { Albuminoids	11·8
Proteids { Amides	1·3
Fibre	2·7
Oil	10·8
Nutrient ratio	1 : 6·5
Nutrient value...	92

"The nuts were tested for alkaloids and glucosides, but no "indication of the presence of such constituents was obtained.

"The results of the analysis indicate that the nuts are likely to "prove a useful food-stuff. A satisfactory point is the presence of "considerable quantities of sugars and oil in addition to the "carbohydrates.

"Judging from the analytical figures alone, the nutrient ratio, "*i.e.*, the ratio of albuminoids to carbohydrates and oil converted "into their starch equivalents, is a very serviceable one, and the "total 'nutrient value' is high. The kernels are rather tough, "and this point raises some doubt as to the complete digestibility "of the carbohydrates other than sugars.

"In preparing the nuts for use as food, it is desirable that they "should be soaked in just such a quantity of water as they can "absorb, since if more be used there is danger of loss of the sugars, "which would diffuse into the excess of water."

We have already seen that in Hawea, according to Capt. Wellby, the seeds are stewed before being eaten.

Col. Swayne says 'Yeheb' is wild; Capt. Cordeaux in his letters implies as much. Capt. Wellby speaks of the collection of Gum and 'Yeheb' in Marehan, which probably again implies that it is wild. But Capt. Wellby speaks of 'Yeheb' being 'grown' in Hawea, thus suggesting the possibility that sometimes it may be deliberately planted.

Geographical Area. The material sent by Col. Swayne to the Imperial Institute, and that sent by Capt. Cordeaux to Kew is reported to have come from the 'Haud' or wilderness south of the Dolbahanta country; both say to the south of Bohotleh. Capt. Wellby has explained that seeds of 'Yeheb' which reach the northern coast towns may come from beyond the 'Haud.' No precise locality can yet be given for the material sent by Dr. Warre, but the second lot of seeds came from "a different quarter" from the first. Capt. Wellby's records are precise. He first records 'Yeheb' from Galkayu (Lon. 47° 30′ E.; Lat. 6° 45′ N.) in Mudug, but does not leave it clear that the plant grows in Mudug. He again records it from Adawilif (Lon. 46° 50′ E.; Lat. 5° 55′ N.) in Marehan, clearly indicating that it is there a native. Once more he records it from Gofoddo (Lon. 45° 40′ E.; Lat. 4° 38′ N.) in Hawea. Mudug lies at the south-eastern corner of the 'Haud,' where the Dolbahanta, Midjourten and Marehan countries most closely approach each other. Marehan lies immediately south of the eastern 'Haud'; Hawea is immediately south of Marehan.

Capt. Cordeaux shows that probably 'Yeheb' is not native in the Dolbahanta country, and does not occur anywhere north of the 'Haud'; Capt. Wellby does not record it from Midjourten, east of the Haud. Moreover this officer crossed and recrossed the 'Haud' from Rayarri to Hodayuwein and from Hodayuwein to Bohotleh; later on he crossed the 'Haud' a third time from south to north rather further to the west. He did not record the presence of 'Yeheb' in any of these traverses, all of which were made to the west of the region indicated by Col. Swayne and Capt. Cordeaux. There is no record of its occurrence in Ogaden, which lies immediately south of the western 'Haud.'

'Yeheb' then occurs in Hawea, where it is possibly sometimes planted, in Marehan and perhaps also in Mudug, and is reported from the eastern 'Haud' to the south of Bohotleh; whether its area extends beyond these limits is not known.

The size which the plant attains; whether the plant is ever planted, and if so to what extent; and its precise range are points that can only be satisfactorily cleared up by residents or travellers in Somaliland, to whose attention the whole subject is commended. The present account may, however, enable those who wish to help in settling similar problems to appreciate how necessary it is to supply at the outset complete material and full information.

VII.—MISCELLANEOUS NOTES.

Visitors during 1907.—The number of persons who visited the Royal Botanic Gardens during the year 1907 was 2,962,714. These figures represent an increase of 623,222 visitors over the year 1906, when the numbers were 2,339,492 and up to that time had established a record. The total number on Sundays was 1,268,501, and on weekdays 1,694,213. The corresponding numbers for 1906 were 867,148 and 1,472,344 respectively. The maximum attendance on any one day was 92,277 on August 5th, over 20,000 less than on the corresponding day in 1906, when the attendance was a record one for a single day. The smallest number on any one day was 168 on April 26th.

The detailed monthly returns are given below :—

January	39,685
February	46,845
March	219,498
April	186,092
May	406,867
June	347,709
July	473,309
August	553,814
September	485,201
October	115,735
November	49,154
December...	38,805
	2,962,714

THE REV. RICHARD BARON.—The Rev. Richard Baron, F.L.S., F.G.S., who died suddenly from heart failure on October 12th, 1907, was well-known both to botanists and geologists. He was born at Kendal on the 8th of September, 1847, and was educated at a local school and afterwards at Owens College. He went out to Madagascar first in 1872, under the London Missionary Society's auspices. He remained working as a missionary in Madagascar for 35 years, with occasional furloughs to England. Mr. Baron learnt languages with great facility and was soon able to speak and read Malagasy with fluency. His books in Malagasy, on geology and botany, his French exercises, his biblical commentaries and several of the most popular hymns in the Malagasy Hymnal will long remain witnesses to his varied activity. During his 35 years Madagascar changed greatly and passed from Hova to French dominion. The Hovas pursued a policy of isolation. King Radama used to say that his best generals were "General Fever and General Forest," and when Mr. Baron prepared a small handbook of elementary chemistry he was refused leave by the then Prime Minister to publish it, unless he would omit all mention of the metals. The road between Tamatave, the chief port, and Antananarivo, the capital of the Island, which in Hova times took a fortnight to traverse, now takes a couple of days, and

if the projected railway be made, will only take a few hours, as the distance between the two places is only 200 miles. Mr. Baron first took up the study of Botany in 1880. He was elected a Fellow of the Linnean Society in 1882, and between 1880 and 1905 sent to Kew upwards of 7,000 numbered specimens of plants. His collections were made chiefly in the three central and elevated provinces of Imerina and Betsileoland and Tanala, and as this region had been but little explored previously and fully three-quarters of the plants of Madagascar are endemic, he discovered a thousand new species, which were described by Mr. J. Gilbert Baker principally in the XXth and XXVth vols. of the *Journal of the Linnean Society*. When at home on furlough in 1888 Mr. Baron contributed to the Linnean Society a valuable paper on the regions of Botany in Madagascar (*Journ. Linn. Soc.*, vol. xxv., pp. 241–294, with a map).

Studying, during a furlough at home, under an eminent petrologist, the peculiarities of rock structure, he became an expert himself in such investigations. During Mr. Baron's last visit to Europe his paper at the Geological Society on Madagascar geology led to his election as a Fellow of that Society. A further mark of scientific appreciation of his work was shown by the gift of a valuable microscope for the study of rock structure from the Royal Society and also by the award of the Murchison grant for geological research. A gold medal from the Marseilles Exposition and the Vice-Principalship of the Académie Malgache are also proofs of the appreciation of his scientific knowledge by the French officials. Being an authority on Malagasy, geology, botany and French he was offered valuable appointments, but always refused to leave mission work and take up service under the Government. Repeated attacks of malarial fever and finally an attack of blackwater fever weakened his strength and he returned to England for the last time in April of the present year. He was playing with his children on the sands at Morecambe within an hour of his death. The funeral took place at Kendal on Wednesday, October 16th, and was largely attended by his relatives and representatives of various missionary societies.

J. G. B.

WILLIAM NATION, who died at Clapham on October 18th at the age of 81, was born at Staplegrove, Somerset, in 1826. He entered the Royal Gardens in 1840, whence he proceeded to Peru in 1850 and was head gardener to a Spanish gentleman; later he was appointed a Professor at Gaudeloupe College, Lima. He contributed plants to the Herbarium from 1862 to 1880 and several of his letters are also preserved. One of his plants was figured and described in the *Botanical Magazine* under the name of *Quamoclit Nationis* by Sir William Hooker (*Bot. Mag.* t. 5432) and tubers of this plant, which, before he died, he desired to present to the King, have recently been received at Kew from His Majesty.

Flora Capensis.—Continued progress is being made with this work, which is edited by Sir W. T. Thiselton-Dyer on behalf of the South African colonies. Since the notice in the *Kew Bulletin*

for 1906, p. 186, two more parts (iii. and iv.) of vol. iv., sect. 1, have been issued. In the earlier of the two, Mr. N. E. Brown has completed the account of the *Ericaceae*, in the later he has commenced an account of the *Asclepiadaceae*. The other orders dealt with in part iii. are the *Plumbagineae*, *Primulaceae*, *Myrsineae*, *Sapotaceae*, *Ebenaceae*, and the *Oleaceae* partly. In part iv. the *Oleaceae* are completed, the *Salvadoraceae* and the *Apocynaceae* are dealt with and, as stated above, the *Asclepiadaceae* are begun. The *Ebenaceae* have been described by Mr. W. P. Hiern, the *Plumbagineae* and *Salvadoraceae* by Mr. C. H. Wright, and the *Apocynaceae* by Dr. O. Stapf. For the *Primulaceae*, *Myrsineae*, *Sapotaceae* and *Oleaceae* the editor has been able to make use of the manuscript accounts prepared by the late Professor W. H. Harvey ; the additions rendered necessary owing to the communication of further material from South Africa since Professor Harvey's death have been supplied by Mr. C. H. Wright.

Hooker's Icones Plantarum.—Founded by the late Sir William Hooker in 1837, this publication has now reached the second part of the twenty-ninth volume and the 2850th plate. This part contains the figure of *Cymbogon citratus*, Stapf, which was first published in the *Kew Bulletin* for 1906, but the letterpress is here limited to a Latin description and the synonymy of the plant. Sir Joseph Hooker contributes the description of *Impatiens dorstenioides*, Warb., syn. *Trimorphopetalum dorstenioides*, Baker, a very singular plant, native of Madagascar ; and two plates are devoted to the illustration of *Cordeauxia edulis*, the 'Yeheb' nut of Somaliland. The majority of the figures, however, are of Chinese plants, chiefly belonging to the *Lardizabalaceae* and the *Hamamelidaceae*. *Sinofranchetia* is a new genus of the former group. *Parvatia* and *Holboellia* are reduced to *Stauntonia*, of which seven species are figured and eight described. Of the *Hamamelidaceae*, *Sycopsis*, *Distylium* and *Altingia* are revised, and a number of new species described. *Peglera capensis*, Bolus, is a neogeneric type, doubtingly placed in *Legnotideacae*, though it has also evident affinities with *Simarubaceae*.

Botanical Magazine for November.—The following plants are figured and described. *Arctotis decurrens*, Jacq., *Rhododendron intricatum*, Franch., *Coelogyne Lawrenceana*, Rolfe, *Oldenlandia dolichantha*, Stapf, and *Shortia uniflora*, Maxim. The *Arctotis* is a handsome South African species recently reintroduced into cultivation from Namaqualand, whence Mr. W. E. Gumbleton of Belgrove, Queenstown, received seeds, only one of which germinated. The plant obtained from this seed has bloomed for the sixth time this year, and furnished the material figured. It is a perennial herb 2–3 feet high, with solitary flower-heads about 3 inches across, the ray-florets white above, with a dark purple spot towards the base, and reddish purple beneath. The species was originally introduced into Europe in 1794. *Rhododendron intricatum* is a Chinese species with small leaves and clusters of

very small violet or lilac flowers. The plant attains a height of 18 inches, but flowers when only 4 to 6 inches high. The species has been brought into cultivation by Messrs. James Veitch & Sons, who presented to Kew the plant illustrated. The handsome *Coelogyne* is another of Messrs. Sander's introductions from Annam, where it was discovered by their collector, Mr. W. Micholitz. The large flower has yellow or greenish-yellow sepals and petals, and a reddish-brown lip, with a white front lobe marked with sulphur-yellow. The drawing was made from a plant presented by Messrs. Sander. *Oldenlandia dolichantha* is an annual Rubiaceous plant from East Tropical Africa, and was discovered and sent to Kew by Mr. M. T. Dawe, Officer in Charge of the Forestry and Scientific Department of the Uganda Protectorate. The white flowers are remarkable for the long slender corolla-tube. The pretty little *Shortia uniflora* is a native of Japan, and the Kew plants were purchased from a firm of Yokohama nurserymen. This species is most nearly allied to *S. galacifolia*, Torr. & Gr., found only in North Carolina, and provides one more instance of the affinity of the Japanese and Eastern North American floras.

Botanical Magazine for December.—The plants figured are: *Gesnera cardinalis*, Lehm., *Primula muscarioides*, Hemsl., *Picea morindoides*, Rehder, *Delphinium candidum*, Hemsl., and *Eria longispica*, Rolfe. The *Gesnera* is an ornamental plant with scarlet flowers 2½–3 inches long, and has been in cultivation for many years. The *Primula* is a distinct new species from Western China, where it was collected by Mr. G. Forrest for Mr. A. K. Bulley, of Neston, Cheshire, in December, 1904, at altitudes of from 14,000 to 15,000 feet. The capitate-spicate arrangement of the small purple-blue or almost violet flowers gives it something of the appearance of a *Muscari*. *Picea morindoides* is a native of the Eastern Himalaya, and was first described in 1903 from specimens obtained from Mr. Allard's arboretum at Angers in France. It is also in the garden of Earl Annesley at Castlewellan, and in that of Sir Edmund Loder at Leonardslee, Horsham, Sussex, where it has produced cones for the first time in this country. The *Delphinium* is a new species with large white flowers; seeds were collected by Lady Hindlip between Mount Elgon and Kisumu, Uganda, in 1904, and the plant figured was raised in the gardens at Hindlip Hall, Worcester. It is a very beautiful species. In the figure the flowers are represented with the spurs bent over, but from a recent photograph of a more robust specimen it appears that the spurs should be straight. The scent of the flowers is more like that of the Eucharis Lily than of the Primrose, as stated in the *Magazine*. *Eria longiscapa* is a new Bornean species allied to *E. latifolia*, Reichb. f., from which it differs in having larger flowers, with an orbicular, not obovate, lip. It has long slender racemes crowded with somewhat small, light-yellow flowers blotched with reddish purple. The plant has been in cultivation at Kew since 1898, when it was presented by Messrs. Linden of Brussels. The volume of the *Magazine*, which is concluded with this number, is dedicated to Miss E. A. Willmott, F.L.S., V.M.H., of Warley Place, Essex.